THE AEROPLANE

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Aeronautical Engineering
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GATWICK USHERS IN A NEW ERA

ON the first working day of the second week in June Her Majesty The Queen formally opened the new airport at Gatwick. How drily the shade of the indomitable Marcel Desoutter, one of the inaugurators of Gatwick 23 years ago, must have smiled as recollection of all the arguments against Gatwick ever being required as a major airport came to his mind. Though no longer part of the vast new undertaking, the squat circular terminal building of Marcel Desoutter's Gatwick regards the new Gatwick across the teeming artery of the diverted London-Brighton road. But the basic concept of the first Gatwick, its closeness to the main railway line to Victoria, has been adopted and improved so that as nearly as maybe one steps from train to aeroplane and *vice versa*. With smoothly working and closely integrated Customs and immigration arrangements, this could provide the swiftest link between metropolis and airport yet achieved.

But we shall need faster trains than those at present running. Guests at the Royal opening were commenting on the fact that, even on an occasion of such importance, the journey from Gatwick to Victoria was taking forty-five minutes. However, the development of airports also moves slowly. It is some eleven years since Mr. Peter Masefield, this year's president-elect of the Royal Aeronautical Society, and at that time a high planning official in the Ministry of Civil Aviation, started the ball rolling. Things hung fire for a long time but in the end moved fast. The airport has been built in two years.

In this issue of THE AEROPLANE the reborn Gatwick, as an airport designed to mid-1950 ideas, is described and illustrated. In addition, the requirements for the future are discussed in an article by one whose job it is to study how traffic can be moved most quickly and efficiently.

As regards the design of the new airport, it is to be noted that, whatever the IATA specialists may consider to be good and sensible in the way of terminal and apron design, some authorities in North America (notably at Los Angeles and in Canada) are going ahead with the construction of island sub-terminal systems. In these layouts there is a main terminal centre and a series of embarkation and disembarkation islands in the apron.

These islands are reached by tunnel and there is something drastically final about the construction of such variants of the pier system. However, the concept is one which leaves the apron open and which may well show long-term advantages by comparison with the more immediately acceptable above-ground pier-and-gate arrangements which have been chosen for the first stage at Gatwick.

We must, and indeed do, heartily commend the fact that the new design is one which involves acceptance of the necessity for future air travellers to be much more self-reliant and mobile than they have been in the past. They will need to be self-reliant because a journey from London via Gatwick will involve, in fact, two journeys, each of which will need to be separately organized.

It may be that passengers, familiar with the old ways of airline travel, are not going to like, at first, this double journey and the need to pass through two transport terminals and to find seats in a train. The attractive feature of a town airline terminal has always been that the passengers, once safely there, can then put themselves entirely in the hands of the airline.

But at least there should be no worries for the Gatwick passenger about whether or not the airport station has been reached. Gatwick's new station is splendidly equipped with a long succession of lighted signs along the platforms. This identification feature might usefully be applied to all railway stations.

Personal mobility will be needed by the Gatwick passengers, just as it is at domestic airports in the United States, because of the comparatively long distances which will have to be covered on foot while carrying hand-luggage. First there is the journey up the stairs out of the station and into the concourse, and then along the 880-ft. pier to an apron gate which may be at or near, the very end of it.

People are quite accustomed to being both self-reliant and mobile when using other forms of transport but they have, so far, been more than a little mollycoddled by the airlines and the airport organizations. Gatwick, once the passengers have settled down to the routine and have learnt to find their way about, first at Victoria and then at the railway station-cum-terminal, is going to do much to change the habits of air travellers. So many people have already realized that there is nothing unusual or particularly splendid about air transport that this is as it should be.

We do, however, feel that further study is needed of the requirements of elderly folk and others not well equipped to carry heavy cases. This problem has frequently been encountered by us while travelling by air. The business of arranging for the transport of heavy cases and luggage once one is off the aeroplane needs much more study.

MATTERS OF MOMENT

More Hunters for Switzerland

AN ORDER for a further 100 Hawker Hunters may be placed by the Swiss Government with Hawker Aircraft, Ltd. This follows the cancellation of orders for 100 Swiss P.16 fighters after two prototype aircraft had crashed in Lake Constance during test flights. The crashes were caused by a defect in the power-control system.

Last March the Swiss Government gave its approval for the order of 100 Hunters from Britain at a cost of £26 million. On June 5 the Swiss Federal Parliament was told that it would be asked to approve an order for another 100 fighters—these will probably also be Hunters. Detailed proposals will be put before the Parliament in September.

Cancellation of the P.16 will affect the order for the Armstrong Siddeley Sapphires which were to power the Swiss fighters. It is understood that any additional Hunters ordered will be Avon-powered.

The Swiss have already taken delivery of one Hunter from the initial order of 100. The remainder will be delivered between August this year and the end of 1959.

Helicopter Association Affairs

MR. ERIC MENSFORTH, C.B.E., M.A., M.I.Mech.E., F.R.Ae.S., M.I.P.E., chairman of Westland Aircraft, Ltd., and of Normalair, Ltd., took office as the new president of the Helicopter Association of Great Britain at the annual general meeting on June 6. This is Mr. Mensforth's second spell as president, for he occupied that office from 1952 to 1955. His long experience of aeronautical affairs and of the helicopter world will again prove invaluable in guiding the Association's affairs—which at the present time have reached a somewhat critical stage.

This was indicated by the chairman of the Helicopter Association, Lieut.-Col. J. W. Richardson, A.F.R.Ae.S., in his annual report to the meeting. Membership subscriptions, he pointed out, have had to be raised and even then the Association was still dependent on donations for its existence. The Council, he said, was constantly studying how best to further the aim for which the Association was formed. In this connection he referred to a proposal that it should be merged with the Royal Aeronautical Society.

" About 18 months ago," said Col. Richardson, " a suggestion came, from a source outside the Association, that our aims and objects are, so to speak, on a narrow front, what those of the Royal Aeronautical Society are on a wider one. It was suggested that this concentration of our effort could be as well achieved, indeed might be better achieved, within that wider effort.

" From this came the suggestion that the Society, which was intending to form certain specialized and largely autonomous Sections, should invite the Association to become merged within it—becoming its Rotary Wing Section, retaining, however, an

BRACKNELL PARTY.—At a reception at the Staff College at Bracknell on June 6, Flt. Lt. Benstead shows a Hawk symbol of the College to Air Chief Marshal Sir Walter Dawson, Inspector-General of the R.A.F., and Lady Dawson.

DARTS ON THE LINE.—A recent production-line photograph from the Fairchild company in America showing their licence-built Friendship final assembly shop. These aircraft are powered by Rolls-Royce Dart turboprop engines.

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individuality which would be reflected in an addition to the title of the Society. We set up a Committee to study those proposals, or elaborations or modifications of them, and to discuss such possibilities with a Committee of the Society.

"I cannot say here whether anything may come of this, except that if common ground (and obviously some such exists, or we would not still be talking about it) can be found which satisfies your Council, then the matter will be put before the Members in full detail in the proper way, and you will be asked to decide upon it. I cannot say if that will be, or when it will be . . . ."

However exploratory these negotiations are at the moment, one thing is certain—the new council of the Helicopter Association will have a major task in ensuring that any firm proposals that are agreed will not result in our lively rotary-wing protagonists losing their collective identity within a much larger —and older—organization. However much common ground there may be for a merger and however desirable it may be for economic considerations, this is a case, if ever there was one, of making haste by moving with extreme caution. Many people believe in any case that the time is not yet ripe for such a major step to be taken.

Westland's Turbine Helicopters

WHETHER by coincidence or good planning, the first appearance of the prototype of Westland's new Westminster helicopter a matter of days before a lecture on turbine-powered helicopters—to the Helicopter Association by the company's technical director, Mr. D. L. Hollis Williams, B.Sc., F.R.Ae.S.—was most appropriate. Indeed, the practical demonstration of the progress that has been made with the Eland-powered Westminster to date added point to the lecture and made it particularly timely as it dealt at some length with the helicopter's principal features and background. Photographs are on page 829.

It traces back to the time when Westland entered into a licence agreement with Sikorsky for the S-56, which is powered by two Pratt & Whitney R2800 engines mounted in pods on a stub wing set in the high wing position.

In the U.K. the only suitable powerplant that was available was the Napier Eland. This turbine engine was already under development with a rear drive and it appeared that the best proposition would be to dispense with the stub wing and the engine nacelles and to mount the turbines on the cabin roof, forward of the main gearbox. The Westminster project has developed as a combined Westland/Napier private venture.

The Eland is a fixed-shaft turbine—a type with which Westlands had no actual experience, and the problem was made more difficult by using a pair of fixed turbines driving on to a common rotor shaft. Fortunately Napier had under development a clutch which was also a fluid drive and this was seized on as a method of avoiding direct mechanical connection between the high-energy rotating parts of the two turbines, and in a similar way avoiding direct mechanical connection between the rotor head and the turbines.

For the Westminster project, the main rotor hub, the main rotor blades with the rotor shaft, tail rotor assembly and duplicated power controls are actual S.56 parts.

At the start of the Westminster project there was no firm Operational Requirement, and it was realized that a vast amount of engineering time and money could be spent producing a helicopter which, when complete, was not exactly what was required. It was, therefore, decided to prove the turbines in association with the new parts of the transmission, by building in the first instance a flying test rig, and the aim was to get results in the cheapest and simplest possible manner.

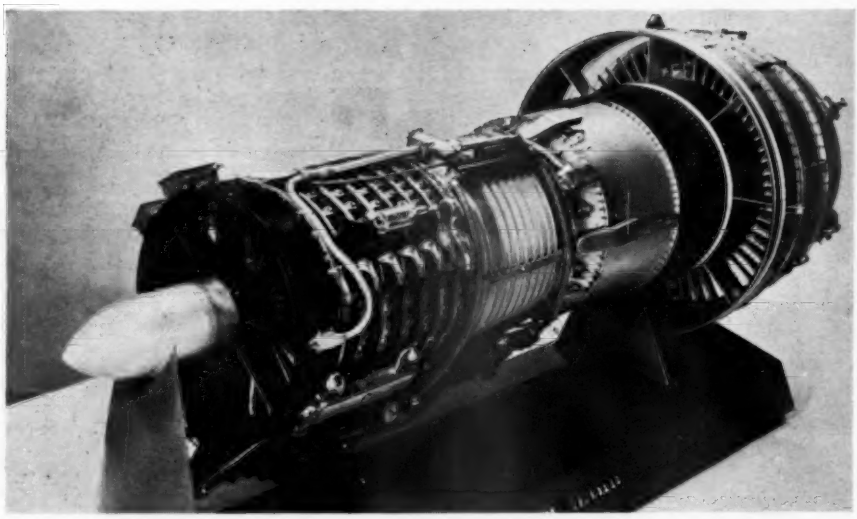
However, said Mr. Hollis Williams, there is no such thing as cheapness or simplicity with a flying prototype of any description. Everything is relative and the company eventually decided that the flying test rig had most of the elements for a successful crane, and should be so developed as a forerunner to the Westminster transport.

In general, the engine installation is orthodox—but the rear drive turbines have fairly long high-speed drive shafts and the mounting of turbines and gearbox on a flexible airframe introduces problems associated with shaft malalignment. The original toothed couplings on these shafts have been replaced

Above, the Saunders-Roe Skeeter being demonstrated before the guests at the Helicopter Association's most enjoyable Garden Party and Rally on June 7 in Dunsborough Park, Ripley. Right, the Westland Widgeon from which the picture below was taken.

Photographs copyright "The Aeroplane"

Above, Mr. and Mrs. Charles Hughesdon, who so kindly lent their house for the garden party, with Peter Wilson, Bristol test pilot (left).



TURBO-FAN FORM.—A quarter-scale model of the General Electric CJ-805-21, a ducted-fan turbojet variant of the J79. The single-stage fan which has been added at the aft end of the engine comprises a counter-rotating free-floating turbine (with no mechanical connection to the main turbine) with the fan compressor around the periphery. The CJ-805-21, which is being studied for the Convair 880 and Boeing 720 in addition to possible military applications in the KC-135 and other types, is in the 15,000-lb.-thrust class and is said to have 8-12% better s.f.c. than the present J79.

by specially designed ball couplings similar to those used in the Gazelle installation in the Wessex.

Mr. Hollis Williams' paper forms a very valuable statement of the various arguments concerned with the selection of turbine power for shaft-driven rotors. He deals first with the general problems of gas turbines versus piston engines as a source of shaft power for helicopters, and then expands his thesis into a discussion of the relative merits of fixed- and free-turbine engines. In this connection it is interesting to note that so far, despite the strong preferences that have been expressed by some people for free-turbine engines for helicopters, Westlands have by no means come yet to any definite conclusions. The final decision, Mr. Hollis Williams says, can only be arrived at after actual experience with both types.

Focus on Fan-lift

WITH both the Fairey Rotodyne and the Westland Westminster in the limelight during the past 10 days, a recent article* on the design problems associated with VTO aircraft by Mr. D. Keith-Lucas, the technical director of Short Brothers and Harland, is of considerable interest. In it he has something to say about fan-lift as a means of achieving VTOL capabilities and he firmly believes that this system is likely to prove a "serious contender" for the short-haul civil market.

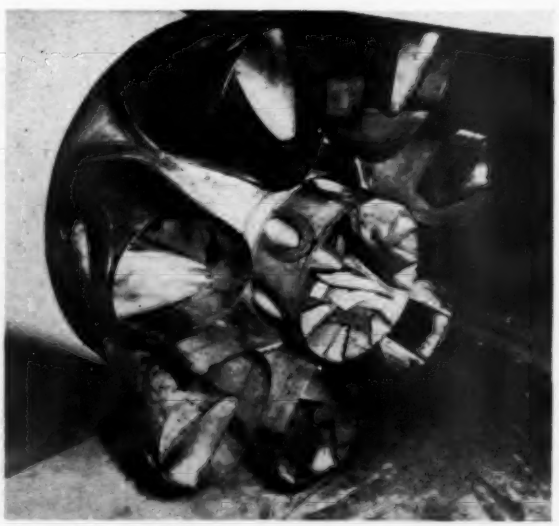
For such a system comparatively large-diameter fans are mounted horizontally in wing ducts. The fans can be shaft driven from the main powerplants or be "turbine powered" by having either peripheral or hub-mounted blades driven by compressed air tapped from the compressors of the main forward-propulsion engines.

As Mr. Keith-Lucas points out, the accommodation of these large fans in a wing might well give rise to some serious structural problems. But, he argues, as the fan-lift scheme can increase the lifting thrust of a jet engine by three or four times and so reduce, by the same factor, the fuel required for vertical take-off and landing, a real effort must be made to overcome the difficulties. In this connection, he suggests that a layout with a large number of smaller fans—possibly fuselage-mounted—might be worth examining.

Some of the basic aerodynamic properties of wing-mounted fan-lift devices have been given in an interesting lecture read last month to the Canadian Aeronautical Institute by R. L. Wardlaw and N. V. McEachern of the National Research Council in Ottawa. This is a report of some exploratory wind-tunnel tests but it contains also some rough figures for a typical application—a medium-range transport weighing 28,500 lb. It would have eight 3-ft.-dia. fans driven by four engines, and a wing with an aspect ratio of 7 having a wing loading of 50 lb./sq. ft. Other characteristics are given as: Fan diameter/wing chord, 0.3; fan pitch, 2.5 fan diameters (centre-line spacing); fan loading 500 lb./sq. ft.; engine sea-level static thrust 2,720 lb.

The authors say that from the chosen ratio of wing loading to fan loading the fan area has to be 10% of the wing area—which, they feel, is not unreasonable on structural grounds "although a significant increase in wing weight would be required." Later they point out that a relaxation of this fan area restriction would result in higher fan power loadings, with consequent reduction in engine size and improvements in power matching between hovering and cruising flight.

*"The New Scientist," May 29.



DC-8 QUIETNER.—This silencing nozzle for the Pratt & Whitney JT3 turbojets on the first DC-8 airliner were manufactured by Douglas to Rolls-Royce designs.

Demonstrating a VTOL Airliner

AN EVENT that was very much in the news last week was the first "public" demonstration of Fairey's Eland-powered Rotodyne. This was, in fact, a notable occasion in its own right for the Rotodyne is the World's first true VTOL airliner and probably the biggest rotary-wing aircraft flying at the present time. But quite apart from these specific claims to technical fame, the demonstration left one with an outstanding impression of a remarkable practical vehicle that in the course of time is likely to represent a significant step forward in aeronautical development generally and in air transport in particular.

With accommodation for up to 48 passengers or 12,000 lb. of freight, the Rotodyne can cruise at 185 m.p.h.; it has a maximum range of 450 statute miles. The design all-up weight is 39,000 lb. with 3,500 e.h.p. Elands but at present, with the 3,000 e.h.p. Elands now installed this is limited to 33,500 lb.

Regular readers of THE AEROPLANE need no introduction to the basic concept of the Rotodyne nor to the way in which it has been achieved. For helicopter operation—that is, for all vertical flight, at take-off and landing, and for hovering—the 95-ft. dia. four-bladed rotor driven by tip-jet units provides all

the lift. For cruising flight the tip-jet units are closed down and the rotor "windmills" in autorotation to provide about 40% of the required lift; the other 60% coming from the fixed wing. Forward thrust for cruising flight is supplied by the normal airscrews.

Compressed air for the tip-jet units comes from auxiliary compressors driven by the two Eland turboprop powerplants. In helicopter flight these airscrews are in almost zero-thrust pitch and are operated differentially to give appropriate thrust for yaw control. For forward flight the auxiliary compressors are clutched out and all the engine power goes to the airscrews.

On June 3, Sqn. Ldr. W. R. Gellatly gave a masterly demonstration of the Rotodyne's capabilities both as a pure helicopter and as fast-cruising composite aircraft. The transition from one to the other was shown to be smooth and effortless—indeed apart from a change in overall sound-level and a few swirls of kerosene vapour from the tip-jet units, the re-light would have gone undetected. This process was described in detail in THE AEROPLANE last week by Sqn. Ldr. Gellatly himself.

In forward flight the Rotodyne with its rotor windmilling has a most lively rate of climb and all the manœuvrability it is likely to need. As a helicopter it is steady and completely omni-directional as required. The high degree of control precision in the helicopter state was particularly noticeable during the vertical landing operation. The touch-down had to be made at less than 3 ft./sec. because the undercarriage is at present rigidly fixed down with side stays and has no more than 4 in. of travel. The reason for this is that with the original undercarriage some ground resonance was experienced, and until the modified version is ready the aircraft is being flown on rigid legs to avoid the ground resonance phenomena.

Despite the technical advance represented by the Rotodyne (it is said to be 3-5 years ahead of any comparable craft anywhere in the World) and its great promise as a piece of air transport equipment, its development is likely to suffer from insufficient financial aid. Although to date it has been a Government-supported research project, there are some doubts about the further help that may be forthcoming.

As the company's chairman, Mr. G. W. Hall, F.R.Ae.S., has said, one might well feel that such an advanced and quite unique aircraft should be supported to the hilt by any government. "However," says Mr. Hall, "as we stand today this is hardly the case and although we shall continue to hope that the Government, when it receives our final proposals, will be generous in their support, our immediate impression is that such support as we secure may be insufficient to enable us to proceed with the development of the Rotodyne at the rate which we consider essential to maintain the lead which the Rotodyne has at present over any other short-range vehicle.

"I can say, however, that I and my board are determined to push ahead with the Rotodyne to the utmost of our ability. If we find difficulties along one road we shall not hesitate to look for an alternative for we have complete faith in the rightness of, and the necessity for, the Rotodyne."

According to present estimates, the first cost of a production Rotodyne will be in the region of £375,000.

As a postscript, it should be added that last week-end the Rotodyne was flown over the Helicopter Association's Garden Party at Ripley—and succeeded in stealing the show from the more orthodox helicopters present.

Leslie Robertson

WITH much regret we record the death at his home at Snitterfield, near Stratford on Avon, on June 3, of Mr. Leslie W. R. Robertson, who until 1957 was manager of the Armaments Division of Sir W. G. Armstrong Whitworth Aircraft, Ltd., Coventry.

Mr. Robertson, who was 62, was educated at St. Aubyn's and Harrow. In 1917 he was awarded the Sword of Honour at the Royal Military Academy, Woolwich, and a year later became a reconnaissance officer to the 3rd Divisional Artillery in France.

For three years after that war he was a pupil in the Loco Shops of the Midland Railway Co., Derby, and joined the Loco Department of Sir W. G. Armstrong Whitworth Ltd., as a technical representative in London in 1922. After managing Kitson and Co., Loco Manufacturers, Leeds, for three years, he became divisional sales manager with the Vacuum Oil Co., Ltd., until 1934. He joined Armstrong Siddeley Motors, Ltd., in 1934, as manager of the Railcar Department, but as a result of the R.A.F. expansion programme the Department was closed down, and Mr. Robertson went over to A.W.A. where he held posts as contracts manager and commercial manager before joining the Armaments Division. In 1957, after a serious illness, he was made publicity manager at Armstrong Whitworth Aircraft, Ltd.—a position he held until his retirement.

Mr. Robertson was a full member of the Institution of Mechanical Engineers and the Institution of Locomotive Engineers. He leaves a widow, one son and two daughters.

GATWICK INAUGURATION.—Left, Her Majesty shakes hands with Captain A. C. Lawson of Transair. He has been presented by the Senior Captain of the Guard of Airline Pilots, Captain P. J. McKeown of B.E.A. Right, Her Majesty follows an explanation being given by Mr. Harold Watkinson, Minister of Transport and Civil Aviation, beyond whom Prince Philip can be seen talking to Mr. Airey Neave, Joint Parliamentary Secretary, M.T.C.A. Nearest the camera is Sir Gilmour Jenkins, Permanent Secretary, M.T.C.A.

News of Aircraft, Engines and Missiles

SAUNDERS-ROE'S LOSS.—Squadron Leader John S. Booth, Saunders-Roe chief test pilot, was killed on June 5 when the second prototype S-R.53 mixed-powerplant fighter crashed on take-off at Boscombe Down. No reason has been given for the crash, but one report stated that the aircraft's tail parachute was found streamed after the accident; the Spectre rocket engine has been reported as having cut out three-quarters of the way down the runway.

FASTER DRAKEN.—It is expected that the Saab J 35A all-weather fighter now in production for the R. Swedish A.F. will be able to operate at Mach 1.8, using an 11,000-lb. thrust Rolls-Royce Avon (RM 6) turbojet fitted with an afterburner developed jointly by the R. Swedish Air Board and Flygmotor. A total of 15,000-lb. thrust is available.

IMPROVED ALOUETTE.—The maximum loaded weight of the Sud-Aviation Alouette helicopter has been increased to 3,527 lb. for military use, providing an additional 220 lb. of useful load.

VARIABLE GEOMETRY. — The Short SB.5 adjustable-wing research aircraft was recently taken from R.A.E., Bedford, to the manufacturers' works at Belfast, for a further series of flight tests. It is to be re-engined with a Bristol Orpheus in place of the Rolls-Royce Derwent and will complete its test programme with the wings swept back to 69°. Previous flight tests have been with 50° and 60° sweepback.

ALL-WEATHER VTOL.—This new cockpit has been designed by Ryan for their Vertijet to give a fully instrumented layout for all-weather VTOL operation.

SABRELINER.—North American have recently completed fabrication of their NA.246 Sabreliner six-seat jet utility transport and combat proficiency trainer to meet a U.S.A.F. requirement. It now awaits installation of two 2,000-lb.s.t. General Electric J85 turbojets, with first flight scheduled for August.

VIGILANTE.—New details of the North American A3J-1 Vigilante are shown in this drawing. Powered by two 15,000-lb.s.t. afterburning General Electric J79-2-GE turbojets, the two-seat Vigilante is a Mach 2 all-weather carrier-based strike aircraft.

VOUGHT FLIGHT.—The Chance Vought F8U-3 Crusader naval fighter (Pratt and Whitney J75 turbojet) made its first flight at Edwards A.F.B., Calif., on June 3. The company claims that it has a Mach-2 performance.

SNECMA IN HOLLAND.—The Dutch company Aviolanda has acquired exclusive rights to manufacture a SNECMA pulsejet for powering the AT.21 target missile being produced for the R. Dutch Navy.

GNAT ORDER.—It is reported that the Yugoslav Air Force has ordered two Folland Gnats for evaluation purposes. The order, which includes ground equipment, is the third export contract for Gnats.

THOR IN BRITAIN.—As a result of accelerated production the Douglas Thor IRBM is scheduled to be in service in Britain before the end of this year. A missile of this type, although designed only for a 1,000-mile range, has in fact been fired 2,700 miles, according to Maj.-Gen. B. Schriever, chief of the U.S.A.F. Missile Programme.

JINDIVIKS FOR BRITAIN.—The Government has ordered an unspecified number of Australian Jindivik pilotless aircraft from the Commonwealth Aircraft Corporation.

GERMAN FIRST.—The first flight of the Baade BB.152, the first East German jet airliner, is scheduled to be made at Dresden on June 20.

AT WHITE WALTHAM.—Sir Arnold Hall, R.Ae.S. President, and Lady Hall, will receive guests at the Society's garden party and flying display to be held at White Waltham on June 22. It is expected that the following aircraft types will be present: Cirrus Moth, Hurricane, Spitfire, Swordfish, Tipsy Junior, Fulmar, Prentice, Bonanza, EP.9, Jackaroo, Blackburn B.2, Turbi, Emeraude and various sailplanes and helicopters, and there will be a Tiger Club display. There will also be a static exhibition.

Commercial Aviation Affairs

INDIA-SOVIET AGREEMENT.—On June 2 the Government air agreement between India and the Soviet was signed in Delhi and came into force immediately. Air India International (using L-1049Gs) and Aeroflot (using Tu-104s) will make weekly return flights, with traffic rights at Amuritzar (Aeroflot) and Tashkent (Air India), between Moscow and Delhi.

WEST AFRICAN CHANGES.—Following the decision of Ghana to form its own airline, Nigeria is to form a new operating company which will start operations on October 1, 1958—the day after that on which the present West African Airways Corporation will have ceased to exist. The Government of Nigeria will retain the controlling interest in the new airline, but will have "commercial partners."

W.E.A.A. MEET.—Formal opening of the Tenth Annual Conference of the Western European Airport Authorities took place in London on June 10.

TASK FORCE CONTINUES.—The ICAO Assembly is providing funds to permit its Implementation Panel to complete its work during 1958 and early 1959. The Panel was formed by the Council in 1956 to study the World's air navigation facilities for turbojet transports. ICAO's budget for 1959 will be $3,672,000 (Canadian)—or $861,200 more than the figure for 1958.

VOR IN 1959.—The M.T.C.A. will require all aircraft using the U.K. airways after April 30, 1959, to be equipped with a VOR receiver (and ADF and a VHF receiver for 75 Mc/s marker beacon reception), or Decca or Gee.

ANTIPODEAN ANNIVERSARIES.—To commemorate the 30th anniversary of the first flight from Australia to New Zealand across the 1,300-mile Tasman Sea, TEAL, the New Zealand airline, is to stage two anniversary flights to coincide as nearly as possible with the route of

Kingsford Smith's and Charles Ulm's flight in the "Southern Cross" on September 11, 1928. A DC-6 will cut the original flight time of 14 hr. 25 min. to 5 hr. The return trip of the "Southern Cross" was made on October 13, 1928, in 22 hr. 58 min.

U.S. TRAFFIC.—The Administrator of Civil Aeronautics, U.S. Department of Commerce, announced in Washington recently that "air traffic at airports and along the airways reached new all-time levels of activity during 1957." Aircraft operations at airports with C.A.A. airport-traffic control towers numbered 25,151,000, an increase of 14% over 1956. Chicago (Midway) continued to be the busiest airport, with 408,059 movements.

EXECUTIVE FACILITY.—Passengers on Eagle Airways' Viscount services from Manchester to Brussels, Frankfurt, Hamburg and Copenhagen are now provided with a free dictaphone service so that businessmen may dictate during flight.

NO COMBINATION.—Jamair Co., Private, Ltd., tell us that the news item in the issue of February 21 to the effect that Indamer, Jamair, and Darbhanga Aviation had combined to form Kalinga Airways is incorrect. The Indamer Company's organization and aircraft have, however, been operating under the permit of Kalinga Airways.

SØNDRESTROM IMPROVEMENTS.—Runway extensions (from 6,000 ft. to 10,000 ft.) began earlier this year at Søndre Stromfjord Airport and a new terminal building and hotel are also to be built.

U.S.S.R. HELICOPTERS.—The first regular helicopter passenger service in the U.S.S.R. is to open this summer between Yalta and Symferopol, a 31-mile journey taking 20 minutes. It should relieve tourist traffic pressure between the Black Sea coast resorts. Civil versions of the Mi-4 will probably be used, carrying 10 passengers. Refinements include sound-proofing, heating and air conditioning. Similar services may also be opened in the Moscow area, operated by G.W.F. (Gosudarstviennyi Vozdushnyi Flot).

LUFTHANSA FLIGHTS.—During the first three years of operations, Lufthansa German Airlines (W. Germany) completed 24,201 flights, 1,921 of which were operated in 1955, increasing to 11,184 in 1957. Passengers carried increased from 74,070 in the first year to a total of about a million during the whole three-year period.

T.C.A. IMPROVEMENT.—A substantial increase in all phases of Trans-Canada Air Lines' operations, resulting in a profit for 1957, is recorded in the annual report. There was a surplus of $404,674. Gross revenues totalled $104,995,707, an increase of 15% over the preceding year. A 16% rise in operating expenses was reported. In 1957, 2,392,713 passengers were carried, a 15.4% improvement. To meet traffic demands 14 Viscounts and two L-1049G Super Constellations were added to the fleet last year.

DUTCH CHARTER.—A new airline company, Martins Air Charter, Ltd., formed by Mr. Martin Schroeder, is to operate in Holland, a concession for charter flights only having been granted up to 1963. Two 38-passenger Vikings will be used, plus two smaller types. The company is reported to be associated with Overseas Aviation (C.I.), Ltd., of Jersey. The new company has also obtained an unlimited concession for pleasure flying in the Netherlands.

NEPAL AIRLINE.—On July 1 all domestic services in Nepal will be taken over by the Royal Nepal Airlines Corporation from the Indian Airlines Corporation. No aircraft are at present owned by the Government of Nepal and these will presumably need to be leased from India.

AIRPORT SURVEY.—Six Australian civil aviation experts are inspecting airports in various parts of the World in preparation for the introduction by Qantas of Boeing 707s on the Sydney-London route next year. After visiting Singapore they left for Bangkok, Calcutta, Karachi, Cairo, Athens, Rome, Frankfurt and London.

NEXT WEEK

In the issue of THE AEROPLANE dated June 20, a large number of pages will be devoted to various aspects of materials technology. This special "Materials and Processes" issue will deal with non-metallic and plastic materials and will contain articles on associated production processes and techniques.

JESSELTON, BORNEO.—The North Borneo Legislative Council has approved an allocation of £200,000 towards the reconstruction of Jesselton aerodrome, where there is at present only a temporary airstrip. Provision is made for a modern terminal building and offices and all-weather facilities.

TRADAIR FREIGHT.—A new freight door measuring 8 ft. 3 in. long by 5 ft. 6 in. deep on a Viking allowed Tradair, Ltd., to carry two Ferrari cars from Helsinki to the Grand Prix at Frankfurt recently. The company hopes eventually to make further improvements to the door.

U.S. MAIL.—Seaboard and Western Airlines has been authorized to carry U.S. mail between the United States and the seven European countries it serves on its daily transatlantic freight flights. The C.A.B. exemption order, which is effective immediately, provides that the company will be compensated on a similar non-subsidy service rate basis as P.A.A. and T.W.A.

ICAO MEMBER.—Costa Rica became the 73rd member state of ICAO on May 31.

A YORK LOST.—One of Dan-Air Services' Yorks flying from London to Singapore, crashed near Gurgaon, 30 miles from New Delhi, on May 25. Four of the crew of five were killed. There were no passengers on board.

Military Aviation Affairs

BEVERLEYS OVERSEAS.—No. 84 Sqn. (Sqn. Ldr. H. W. Guile), M.E.A.F., which has operated overseas since 1920, is now re-equipping with Blackburn Beverleys. Based at Aden, where a detachment of Transport Command Beverleys has been stationed for some months, No. 84 Sqn. will be the first squadron of an overseas command to operate this type.

DUTCH CARRIER.—The 15,000-ton Dutch aircraft carrier "Karel Doorman" was recommissioned on May 29, following a three-year overhaul. Fitted with the latest equipment, the carrier is to operate Sea Hawks, Avengers and helicopters.

C.F.S. REUNION.—This year's reunion dinner of the Central Flying School Association is to be held in the Officers' Mess, R.A.F. Little Rissington, on Friday, July 11. Full particulars are being circulated to all members by the honorary secretary.

R.A.F.A. CONFERENCE.—Delegates at the recent annual conference of the Royal Air Force Association which was held at Edinburgh.

BLOODHOUND OPERATIONAL.—The Air Ministry has denied reports made last week that the Bristol/Ferranti Bloodhound had been relegated to a training rôle, and stated that the surface-to-air missile is deployed as an operational weapon. The rôle of the Bloodhound in the United Kingdom's defence policy is unchanged and the Ministry's statement contained the first official intimation that the R.A.F. is in actual possession of the weapon.

HOME POSTING.—Lincolns of No. 1 Sqn., R.A.A.F., are to make their last sorties against the Malayan terrorists on July 2 before returning to Australia on the completion of eight years' service in F.E.A.F. Due back in Australia on July 17, No. 1 Sqn. will be replaced in Malaya by No. 2 Sqn., R.A.A.F., equipped with Canberras.

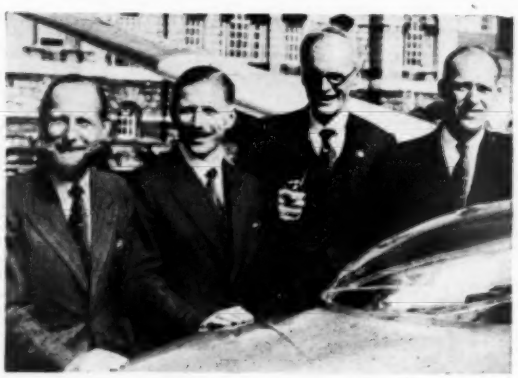
R.C.A.F. RUNWAY BARRIERS.—A contract to install runway arrester barriers at seven R.C.A.F. fighter bases in Canada has been awarded to the All American Engineering Co., of Delaware. The first installation will be at R.C.A.F. St. Hubert, and the remaining six stations will be equipped by the end of the year. Operating on the "water squeezer" principle, the barrier has stopped 35,000-lb. aircraft travelling at 150 m.p.h. without damage.

DUTCH FIREPOWER. — Reports state that F-84F Thunderstreaks of the R.Neth.A.F. are to be equipped for launching tactical atomic weapons. The U.S. has also agreed to equip the Dutch Navy's Seahawks with conventional air-to-air missiles. The atomic weapons for the Thunderstreaks are not yet being stored in Holland.

NORATLAS IN SPAIN.—A demonstration of the Nord Noratlas military transport was given to the Spanish Air Force at Alcala de Henares, near Madrid, on May 22.

CANADIAN FIREBEES.—Ryan KDA-1 Firebee drones powered by 1,000-lb.-thrust Fairchild J44 turbojets are to be used by the R.C.A.F. and launched from Avro Lancasters to evaluate weapons systems.

News About People



SAILPLANERS. — The British Gliding Team is now in Poland for the World championships which start on June 15. Left to right are Cdr. A. Goodhart, Lt.-Col. A. Deane-Drummond, Mr. Philip Wills and Cdr. N. Goodhart. They are seen here in London before their departure.

R.Ae.S. PRESIDENT.—Mr. Peter G. Masefield, M.A., Hon. F.I.A.S., F.R.Ae.S., vice-president of the Society and managing director of Bristol Aircraft, Ltd., has been elected president-elect of the R.Ae.S. for 1959-60. The following have been elected vice-presidents: Air Cdre. F. R. Banks, C.B., O.B.E., M.I.Mech.E., Hon.F.A.I.S., F.R.Ae.S.; E. S. Moult, Ph.D., B.Sc., M.I.Mech.E., F.R.Ae.S., and Air Marshal Sir Owen Jones, K.B.E., C.B., A.F.C., B.A., D.I.C., M.I.Mech.E., F.R.Ae.S.

MASTER AIR PILOT.—G.A.P.A.N. has announced the award of the Master Air Pilot Certificate to Capt. W. R. Wallace, previously chief flying instructor of B.O.A.C.'s central training unit.

BRITAVIA APPOINTMENT.—The general manager of Britavia, Mr. W. E. Hogsflesh, has been elected to the board of the company.

B.E.A. APPOINTMENTS.—Mr. W. I. Scott-Hill, B.E.A. traffic manager since 1953, has been appointed to the new post of General Manager (Traffic). Mr. Scott-Hill, who is 42, joined B.E.A. in the early days of the Corporation's formation; previously he had served with B.O.A.C. and Imperial Airways, which he joined as a trainee in September, 1933. Mr. R. G. Gibbons, former B.E.A. assistant traffic manager, succeeds Mr. Scott-Hill as traffic manager. Mr. Gibbons also served with B.O.A.C. and Imperial Airways.

A.P.R.A. PRESIDENT.—The Rt. Hon. Sir Lionel Heald, Q.C., M.P., has succeeded Air Cdre. Lord Willoughby de Broke, M.C., A.F.C., as chairman of the Air Public Relations Association.

FROM E.M.I. TO ANDEC.—Mr. M. H. Tarbitt, contracts manager of the research and engineering division of E.M.I. Electronics, Ltd., has resigned from that company to join Andec, Ltd., of Reading, as commercial manager.

A PIONEER MECHANIC. — We regret to record the death of Mr. E. Temple Robins, A.F.R.Ae.S., at the age of 70. He started his career in aviation in 1910 as a mechanic with the Grahame-White Flying School at Larkhill. Subsequently he served with the Bristol and Colonial Aeroplane Co., started his own engineering firm, and then joined the staff of Aero Engines (Kingswood), Ltd. His last appointment was in the buying department of Armstrong Siddeley (Brockworth), Ltd.

H. V. CLARKE.—We regret to record the death, on May 30, of Herbert Victor William ("H. V.") Clarke, who will be specially remembered as the chief engineer of Airspeed from 1943, when he joined the Ambassador development team, to 1954, when he left to look after his own company. Before joining Airspeed he was chief engineer and chief designer of Boulton Paul Aircraft (1935-43) and was previously chief designer of Parnell Aircraft.

ELSTREE SERVICE. — C. Crichton-Stuart and P. Kalber (in overalls) who are training at Elstree for their commercial licences show their chief instructor W. H. "Bill" Bailey the photographs of the Junior T.T. Race which he flew home in appalling weather for our associated journal "Motor Cycling" on the day of the race.

Photograph copyright "The Aeroplane"

AIR TRANSPORT

Viscount Operators at Weybridge

AN important aspect of Vickers after-sales service to airlines is the annual meeting of Viscount operators. No fewer than 68 senior engineers, representing 33 Viscount users, came from all over the World to the sixth of these meetings, which took place at Weybridge between June 3 and 5. The meeting was held at a time when Viscounts had just completed more than a million hours in service. There are now some 40 Viscount operators using, in all, 312 aircraft.

At their three-day meeting the airline engineers discussed in detail their experience with Viscounts since the last conference. Points raised ranged in minute detail over a wide field—from a query about Viscount toilet doors locking themselves in flight to more serious questions about the progress of airframe fatigue tests. At every stage there was a full interchange of information between the manufacturer and the operators.

The meeting in no way took the form of complaints by airlines and excuses and explanations by the manufacturers. In many cases Vickers asked airlines for their opinion of certain installations; airlines asked each other about points of interest such as experience with airsteps and gas-turbine auxiliary power units. Discussions between operators were obviously of the greatest use both to themselves and to Vickers-Armstrongs.

The minor nature of many points raised reflects the years of successful service which lie behind the Viscount. They showed, however, that no aircraft is ever beyond the stage where minor modifications are necessary; a number of small alterations was described. Many of these were the inevitable repair schemes and improvements which become necessary as aircraft get older.

Experience with the Viscount's Dart engines was discussed. Dart inter-overhaul life now ranges from 1,200 to 2,000 hours. In due course all operators should achieve 2,000 hours. Turbine-blade life has been increased by operating the engine at lower temperatures; despite this the engine still improves upon its brochure performance.

It was interesting to note that many of the queries were those raised by a single operator; the faults described often resulted from service in conditions peculiar to one airline only. Several airlines, however, had criticisms of modification procedures and instructions. These were discussed thoroughly at the meeting and its recommendations will be taken into account in a revised system which is planned.

It was obvious that personal meetings of this sort do a very great deal to establish and maintain good manufacturer/airline relations. British aircraft constructors who are entering the civil field could learn a great deal by sitting in on one of these Vickers meetings.

Route Analysis by Computer

ROUTE and flight-plan studies by Vickers-Armstrongs are no longer calculated by lengthy traditional methods—they are now worked out rapidly on the company's Ferranti Pegasus digital computer.

Three tapes are fed into the computer. The first is a programme tape detailing the route-analysis operations to be performed by the computer. The second is a tape which carries the performance of the aircraft under study; and the third carries details of the route over which it is assessed.

Results flow rapidly from the computer. They are recorded on punched tape. This tape passes through a teleprinter-type decoder which produces results typed on foolscap-width paper sheet. This sheet can be sent immediately to the operator if necessary. Alternatively the decoder can type the results directly on to a litho plate from which copies of the route analysis can be printed.

This new technique has two great advantages—it enables route studies to be produced much more rapidly than in the past and it allows the performance of projected new aircraft or variants to be assessed rapidly over the route networks of many airlines. Using the computer a series of route analyses has been produced overnight. In one case an urgent request for a route study, telephoned from the Continent, was answered within an hour.

Of even greater value is the ability to assess the value of projected aircraft to many airlines. If, for example, a special variant of the Vanguard is being assessed a series of route studies can be made very rapidly as soon as the aircraft's basic characteristics are known.

International Freight Prospects

LAST year (see THE AEROPLANE, November 29, pp. 802-804) Professor Stanley H. Brewer prepared for Boeing a study of the U.S. domestic air cargo market. Now Boeing have issued another report from Prof. Brewer—covering the much wider field of the international air cargo market.*

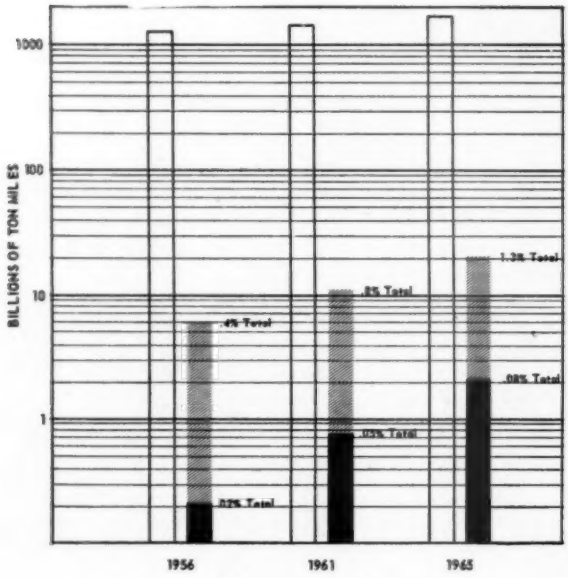
This 177-page report is an immense work and, in investigating all aspects of cargo transport, Prof. Brewer comes to the conclusion that the growth-rate of U.S. international air freighting between 1961 and 1965 could be between 27% and 32%, with a possible total cargo ton-mileage of 2,555 million in 1965!

The forecast is based on the total potential, the past growth, economic trends, the likely developments in the availability of aircraft, the cost of operating the newest types of aircraft and other factors. Prof. Brewer suggests that the disposal of large numbers of four-engined, piston-driven transports of modern design to large, irregular carriers at low prices could

*"U.S. International Air Cargo Future," by Stanley H. Brewer, Professor of Transportation, University of Washington. Issued by the Boeing Airplane Company, Seattle 24, Washington.

AIRLINE HELICOPTER.—These two pictures show the interior of one of New York Airways' Vertol 44Bs, the entry door with its integral stairs and one of the built-in floats.

Photographs copyright "The Aeroplane"



In this "prediction graph" of U.S. international trade, the open vertical columns show the total cargo; the black columns show the present and likely air cargo traffic; and the shaded columns show the estimated air-cargo potential. The "billions" are of the U.S. variety (1,000 millions).

bring about intense competition for international freight movement.

The estimate of potential international air cargo which Prof. Brewer uses in making his current forecast is based on a detailed analysis of present surface freight movements between the United States and foreign ports. This indicates that between one and two per cent. of the cargo at present moved by sea "might be categorized as air potential in the right circumstances."

The report, while outlining the prospects, explains that the amount that can be realized will depend upon several factors. The availability of long-range high-payload, low-operating-cost equipment is the most important one. Even with the aircraft that are available today, the untapped potential is very great. In areas where an intensive programme has been pursued to develop air freight, sizeable quantities are now being moved.

There are also many factors holding back the rapid development of international air cargo. For instance, the design and construction of adequate air-freight terminals is still awaited and shippers must be re-educated to think in terms of total distribution costs rather than the cost of transport.

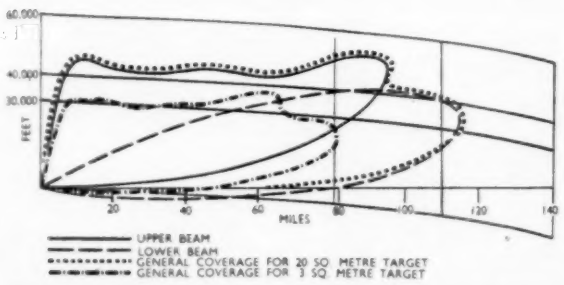
Long-range Terminal Radar

A CONTRACT for the supply of long-range terminal air surveillance radar facilities has been awarded to Decca Radar by the Swedish Board of Civil Aviation. Gained in open international competition tender, the order is for installations at the new air terminal at Stockholm and the airport at Gothenburg.

Civil aviation authorities have recently made strong recommendations for the increase of radar cover over airways as an essential measure to assist air traffic control, and the new Decca equipment has been developed to meet the requirements for long-range cover at terminal areas. The overall performance proposed for such radars calls for "gap-free" coverage up to 30-40,000 ft. at 100-mile ranges, with high target response from the smaller as well as larger aircraft. A military fighter, such as a Hawker Hunter, has a target area of only 3 m² compared with the 20 to 30 m² of an average civil transport.

Known as the Decca Air Surveillance Radar 1 (D.A.S.R.1), an S-band (10 cm.), 800-kW. equipment, its actual performance against a typical target of 24 m² equivalent reflecting area is stated to be continuous and gap-free from 10 to 135 miles at 50,000 ft. The aerial system used with the D.A.S.R.1 consists of two reflectors mounted back to back. Each is fed from a separate 800-kW. transmitter and radiates an overlapping beam of energy. The two beams are highly directional, the lower one providing the maximum long-range performance that can be realized, while the upper beam maintains the high-altitude cover into close range.

The method of ground echo suppression employed is known as Air Target Indication (ATI) and uses the radiation pattern in its operation. It was originally developed to provide permanent echo suppression without using the electronic means of a Moving Target Indicator (MTI); ATI is an inherently "fail safe" system and has no blind speed or radial course limitations.



A diagram illustrating the minimum coverage of the two-beam back-to-back aerial system of the D.A.S.R.1. The radar provides anti-collision warning against small aircraft to a range of 80 miles at 30,000 ft., and general "gap-free" coverage to 135 miles at 50,000 ft.

The two-beam aerial system of the new Decca civil air surveillance radar. The aerial horizontal beam width to half-power points is 0.95° and the array rotates at 10 r.p.m.

To tune out rain or snow returns on the display the equipment has variable polarization control. This can be remotely operated from the display position and allows the controller to select any type of polarization to suit the prevailing weather conditions. This system means that dangerous storm centres can be made just visible on the displays, so that aircraft may be vectored round them.

The displays are of the Decca Interscan series. These are designed so that, in addition to the normal radar picture, information can be electronically displayed. To do this a technique known as Interscan is used, which can take many forms, such as runway extension lines, marker symbols for holding points and so on.

Airport Equipment and Installations . . . .

Terminal Design for the Jet Age

In this article, MR. E. P. WHITFIELD, *British European Airways' traffic director, discusses airport terminal requirements through the eyes of a user. Mr. Whitfield was a member of the Millbourn Committee on the development of London Airport whose report was published last summer.*

IN 1957, the airlines of the "free World" flew 50,000 million passenger-miles, and although this year the rate of expansion of airline traffic has slowed down as a result of the temporary recession in World trade, only the fainthearts believe that this is the start of the flattening of the curves in the industry's spectacular rate of growth since the end of World War II. By 1970 the total is expected to reach the astronomical figure of around 250,000 million passenger-miles in one year. Put simply, this means that the airline industry is expected to grow to five times its present size in the next 12 years.

The advent of the jet age means that the vast new fleets of aircraft which will be needed to carry this volume of traffic will travel at speeds approaching the subsonic range. Clearly, such a major step must be matched with a parallel development and expansion in airports if the full potential of these aircraft is to be realized. And until the industry is in a position to take its next major step forward with the introduction of vertical take-off aircraft the airport problem is going to be a critical one for the airlines.

Major plans for the enlargement and improvement of airports are currently being studied or implemented in most of the important air traffic generating centres of the World. So much can be said and acknowledged, but what the airline operators are anxious to secure is that the terminal and apron sides of airport development will help them to achieve certain basic objectives.

First—to solve the acute problem of the ever-growing disparity between the time spent by the passenger on the ground and in the air in the course of his journey.

Taking the London-Paris route as an example, Imperial Airways before the war were using the Handley Page H.P.42 with a cruising speed of 100 m.p.h. B.E.A. are now operating the Vickers Viscount V.802, which is over three times faster. Looking to the future, cruising speeds will go up to 425 m.p.h. with the Vanguard, and to nearly 600 m.p.h. with the de Havilland 121. This is, of course, a very spectacular rate of progress—until one examines what differences these speeds have made and will make to the time taken by the passenger from the centre of London to the centre of Paris. And at this point we come face to face with the disappointing fact that in 1958 the journey is only 40 minutes faster than it was a quarter of a century ago. In fact, the passengers' journey from the town terminal to aircraft departure takes almost the same time as the flight between the two cities.

Second—to improve aircraft utilization and punctuality performance.

To quote an example, although B.E.A.'s aircraft utilization has improved over the years with mainline aircraft now running at an average of about 2,300 hours a year, they still spend about 30% of their time on the ground during the most commercially useful hours of the day.

The ground side of the airline must, therefore, contribute towards achieving a higher utilization by quicker turnrounds and shorter transit times.

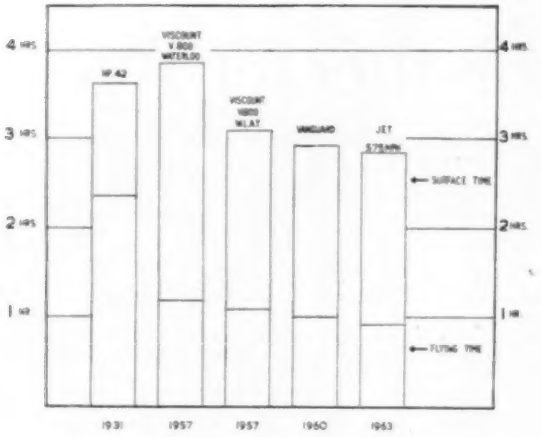
Of vital importance is the need to improve punctuality performance, which is perhaps the direction in which most of the World's airlines need to improve if the public are to place reliance on the published schedules in making their business and private arrangements. Punctual operation must in turn affect the utilization of an airline's aircraft and the importance of these two factors is underlined by the very heavy prime cost and standing charges of the new transports.

Third—although the airlines are moving into the mass-travel

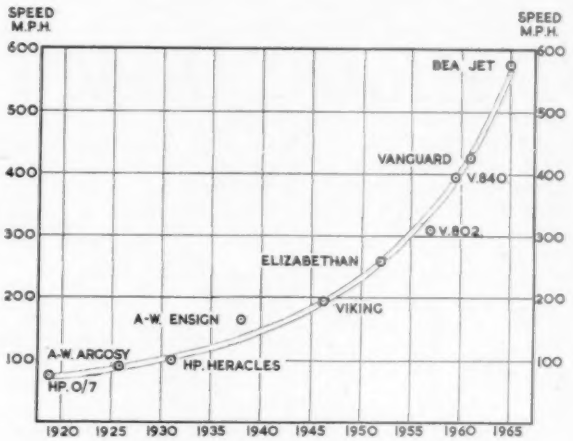
This air-to-ground view of a part of the international arrivals and airline wing building at New York International, Idlewild, shows how a pier system can be developed into an integral part of a terminal. Another photograph of the developed Idlewild, on page 814, shows the relationship of the international building to the airport layout as a whole.

Howard Levy photograph

Airport Equipment and Installations . . . .



"The ever-growing disparity between the time spent by the passenger on the ground and in the air in the course of his journey." This diagram offers a comparison of times on the London-Paris route between 1931 and 1963.



A graph of the cruising speeds of the aircraft used on the London-Paris route between 1919 and 1965.

market they must continue to give a good personal service to their passengers at an economic cost.

B.E.A., for example, expects to carry close on 10 million passengers in 1970 compared with 2.75 million last year. The average revenue return per passenger is low compared with that of a long-haul carrier, and the rate will be reduced further with the inevitable spread of economy fares in Europe from the North Atlantic in the next few years. On the other side of the coin, staff costs run at about 39% of total expenditure —and personal service means staff, and staff cost money. In fact, the general economic position of an airline like B.E.A. can be illustrated very simply by saying that, with a typical load of 40 passengers boarding a V.802 aircraft, no fewer than 16 are required to pay the cost of staff.

FARES AND COSTS

Of the average of 40 passengers who travel in a 57-seat Viscount 802, the fares paid by

16	will cover the cost of pay, allowances and persons.
5	will cover the cost of fuel and oil.
4	will cover the cost of maintenance.
2	will cover the cost of fleet.
2	will cover the cost of commission.
10	will cover the cost of other expenses.
1	will provide the airline's profit.
40	
17	empty seats (i.e., approx. 70% load factor).
57	

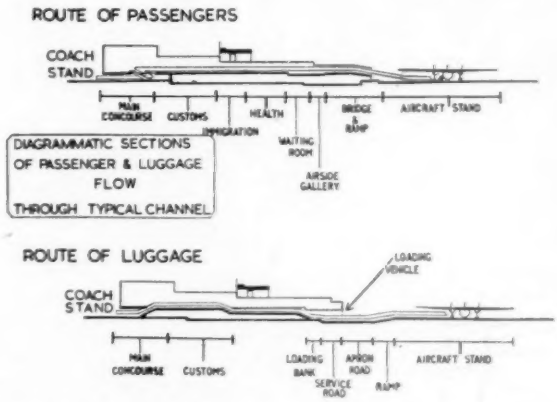
Airport terminal design and layout can have a material and sometimes a decisive influence on these three objectives —leading to a reduction in ground times, improved utilization and punctuality and better personal service at reduced costs. And, of course, as both airports and airlines exist for the benefit of the passengers, their interests should be paramount. What then does the customer want? The answer must surely be that the passenger, naturally, wants to get airborne as quickly as possible. For the average passenger this means the minimum of fuss and regimentation and the shortest distances to walk.

Above all, he wants to be treated as an intelligent adult individual who can get through what he has to do quickly and to have any particular difficulty dealt with promptly and courteously. All of which I am sure is a perfectly reasonable attitude for the passenger to take. Why, then, is he subjected to the frustrating irritation of being led about as an impotent member of a group? Why is he "processed," "penned," "assembled," "shepherded," "embussed"—to use familiar terms—and blared at constantly over public address systems, to be finally delivered in a mood of explosive irritation at the aircraft door?

Well, of course, the airlines cannot escape their share of responsibility for this state of affairs. Like all traditions, that which was born in the early days of aviation, when every passenger had to be cajoled and soothed into facing the rigours of an air journey, dies hard. But an equal share of the responsibility lies with the airport planners on two counts.

The first was to design airport passenger terminals as imposing symbols of national prestige instead of functional buildings custom-tailored for the job. The result has been that all over Europe these vast marble halls have been created and it has proved quite impossible for anybody to find his way through them without the assistance of expensive armies of airline guides.

The second is that the planners seem to have disregarded the rule that the problem should be treated as an integrated whole. It almost looks as if one set of people have concerned themselves with the design of the terminal and a different set with the layout of the apron. The result has inevitably been the lack of a self-evident way which a passenger could follow to reach his aircraft. It is almost as if somebody had planned a railway station with the trains parked in a marshalling yard and the



"Passenger and baggage flows should be self-evident, as short as possible and unimpeded by any form of obstruction." This diagram shows the flows through London Airport Central.

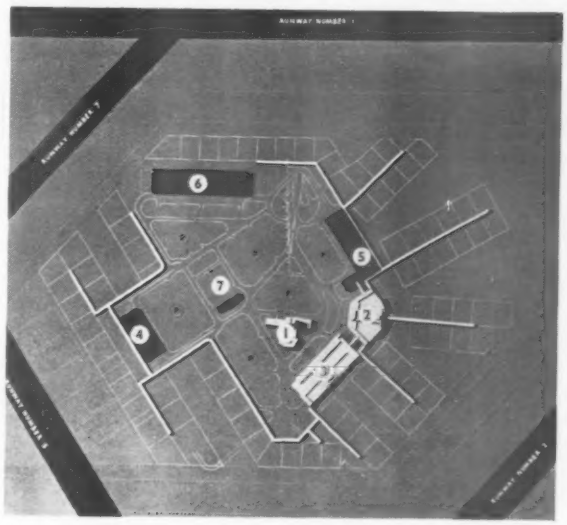
passengers having to be led in groups by experienced staff to ensure not only that they boarded the right train, but also to prevent them from being knocked down by a shunting engine on the way. If one were to add that the whole process had to be done in the open, the parallel would not be exaggerated—and, a stationary aeroplane can quite neatly chop off somebody's head whereas a train has at least to be in motion before it becomes a lethal weapon.

When we come to translating these thoughts into bricks and concrete, what is the best approach? To begin with, one has to recognize that the shape, size and layout of a passenger terminal are influenced by many factors. The type and volume of traffic—present and forecast—site limitations, the existence

or otherwise of the various Government controls will all have major influences. One cannot therefore produce a standard pattern of an ideal terminal and expect such a pattern to fit all circumstances—nor could one hope to encompass in one article all the detailed aspects of terminal design. Careful planning and, above all, close consultation with the airlines are important. We are fortunate in this country that the closest collaboration exists between the Ministry of Transport and the airlines—as is evidenced by the composition of the Millbourn Committee—and the fact that all the airlines using London Airport were consulted before the plan for the future development of London Airport was presented to the Minister.

There are, however, certain basic principles which apply equally to any terminal building irrespective of size and function. The first is to restate the fact that the functional purpose of the building must take precedence over aesthetic appearance. Let me, however, correct any impression I may have given that I do not think that good architecture is important. Certainly a passenger terminal should look as attractive as possible, so long as this does not impose any penalties on passenger-flow and amenities, or add appreciably to the cost of construction by the use of unnecessarily expensive materials.

Secondly, the building should be capable of handling the estimated passenger traffic without the dislocation caused by additional construction or major alteration for at least 10 years ahead. Moreover, the initial plan must be capable of expansion, so that the building(s) can handle traffic up to the maximum runway capacity of the airport, making optimistic allowances for improvements in the aircraft movement rate as a result of developments in air traffic control and landing aids. These principles apply with equal force to all ground facilities at airports and include apron space, car parking areas and cargo warehouses. The development of civil aviation has been



"The pier system . . . makes it possible for passengers to board aircraft individualy without being conducted or transported." A photograph of the Millbourn plan for L.A.P. Central. Key: 1, control and administrative building; 2, Queen's building; 3, S.E.-face passenger building; 4, proposed long-haul terminal; 5, proposed new short-haul terminal; 6, proposed freight building; 7, fuel installations; and P, car parks.

hampered so often by timorous and unimaginative planning and lack of faith in the future—and, so far as buildings and ground facilities are concerned, it has invariably been a case of "too little and too late."

My third point is that passenger and baggage flows should be self-evident, as short as possible and unimpeded by any form of obstruction. The ideal, which I appreciate can only be achieved at the smaller airports, is for the traffic to be handled at ground floor level, with proper separation of departing and arriving passengers.

If the size of buildings or site limitations prevent this, the best alternative is to have all departing traffic handled on the first floor and arriving traffic on the ground floor, with a ramped road on the landside of the building for departing passengers. In all other cases changes of level should be kept to an absolute minimum, and there is much to be said in favour of keeping all baggage-handling and movement to the ground floor.

I have said that passenger flows should be self-evident so that passengers can make their own way individually to the

"The signs . . . should be either multi-lingual or illustrated by easily understood symbols . . . ." These two signs are among those at the West London Air terminal.

aircraft and here may I emphasize the importance of adequate signposting. The signs should be bold enough to command attention, even if they detract from the aesthetic appearance of a passenger concourse. They should preferably be either multi-lingual or illustrated by easily understood symbols and there are great advantages in associating them with a colour code, using lights at intervals to indicate the route to be followed. There is an opportunity here for the airport authorities and the airline industry to get together and produce a standardized scheme for signposting which could be universally adopted and with which the traveller could become familiar.

The fourth principle is that the planning of the layout should ensure the concentration of inter-related airline functions, so as to avoid the dispersal of personnel and equipment. For the same reason complexity in internal layout should be avoided as this results in the uneconomic deployment of staff for directing and conducting passengers. The layout should permit flexible operation to cater for changes in handling techniques and alterations in control procedures and requirements—with the aim of their ultimate abolition.

Touching on two points which may sound very minor, but which are, in fact, important—I come to the question of concessions and spectators. Every airline operator is in favour of the airport authorities exploiting fully the revenue to be derived from letting concessions—for the obvious reason that this not only provides a service to the passenger, but also offsets the operating costs of the airport. The concessionnaires should, however, be located so that they do not divert the passenger flow through the building.

And on the question of catering, at airports, more attention should be paid to the provision of the coffee-shop, or self-service cafeteria, than to the luxury style restaurant. So often the air traveller who has only time for a quick meal is frustrated because the only choice is to sit down in an over-crowded restaurant where the chances of attracting the attention of the harassed waiters are slim indeed. There is, of course, a place for a restaurant with waiter service, but the main emphasis should be on the coffee-shop, which is well adapted to cater for the needs of the air traveller.

Turning to spectators it is impossible to create an absolute Iron Curtain, but it is important to plan the layout so that they can be kept separate from the passengers. Most of the difficulties can be overcome if, for example, access to spectator areas on the roofs of terminal buildings can be gained without entering the passenger areas inside the building. If this point is overlooked, unnecessary difficulties are created for the airline operators by the influx of hordes of sightseers at week-ends and on public holidays. They should be encouraged to visit their national airports, but sensible planning will ensure that they do not impede the business of air transport.

So much then for the air terminal building. I must now turn to the methods of getting the passengers from the terminal building to the aircraft and, in this respect, to compare European and American practice. In Europe, at present, aircraft are generally parked on an open apron and passengers either have to walk to their aircraft or be taken to them in a coach. By contrast in the United States the passengers find their own way to their aircraft, which is positioned at a gate in a pier or finger

Airport Equipment and Installations . . . .

"The two-level overground finger offers the best solution for major airports." This is the pier at the new Gatwick Airport; it has 11 gate positions. The structure above it in the centre is the apron marshaller's control tower.

stretching from the terminal building to the aircraft parking stands. I am certain that the latter system is the right answer to the problem, and increasingly this method is being adopted by European planners for the development of airports.

The pier system permits the operation and servicing of a greater number of aircraft in close proximity to the terminal building than does the open apron system. It makes it possible for passengers to board aircraft individually without being conducted or transported. It provides fixed operational stand positions which give a reference point for sited servicing installations. It reduces to a minimum the potential exposure of passengers to vehicle and aircraft traffic hazards. It permits extension of the system with relative ease—unless the piers themselves have to be realigned. It facilitates the installation of telephones at gate positions, thus resulting in better communications from points within the terminal building and elsewhere to the vicinity of the aircraft operational stands. It affords an improvement in the punctuality of operations, since the gate clerk is positioned close enough to the aircraft to be able to effect a tighter control of operations. An important by-product is that late passengers can be accepted at a time nearer to that of the scheduled departure of the service. And—of great importance to an airline like B.E.A.—it offers potential economies in manpower for high-frequency operations.

These advantages are common to all finger systems—which can take the form of fenced walkways, one- or two-level enclosed piers, or tunnels. Clearly, fenced walkways are unsuitable for jet operations, and the choice must lie between the other two forms of access. These not only provide good weather protection but, more important in the context of jet operations, they reduce to a minimum any inconvenience to passengers from blast and noise caused by departing and arriving aircraft. The main disadvantages of a finger system are the additional cost of construction, maintenance and other running costs, and the inflexibility common to any fixed installation. The system adds to the complication of manœuvring aircraft on the apron and places a limitation on aircraft parking configurations because of the effects of aircraft blast both in the direction of the pier and other parked aircraft. And, unless proper precautions are taken, there is the possiblity of a greater concentration of noise within the terminal building, because of the funnel effect created by the pier itself. Similarly, there is the problem of dust and fumes penetrating the building.

In my view, the two-level overground finger offers the best solution for major airports, particularly if it is associated with either a two-level or a one-and-a-half-level terminal building. If, in addition, the gate can be linked with the aircraft door by means of a passenger loading gangway, then we shall have found the solution to many of our problems. Individual trickle-boarding of passengers without change of level, and full protection from all hazards and inconvenience, sounds not only an airline traffic handler's dream, but something which the passengers themselves would very much like. The two-level pier enables vans to pass under the pier at ground level and provides accommodation for maintenance and apron services, equipment and personnel, as well as for airline offices and facilities and for Customs purposes. Although a two-level pier is a more costly construction the additional expenditure is offset by economies in the main terminal building, and improvements in the passenger and baggage flows which can result from the siting of ancillary offices under the pier itself. Additionally, the utilization of the roof of the pier as a spectators' enclosure is an attractive feature which can increase the airport's revenues and yet achieve the desired segregation of spectators from normal airline activity.

Furthermore, I can see no insurmountable reason why the pier system should not function effectively with jet aircraft. At the IATA Technical Conference in Miami last November there was complete unanimity that jet aircraft should be manœuvred on the ground under their own power. The industry recognized that jet aircraft would create a number of serious problems, but felt that positive and constructive solutions could and should be found which would not penalize the jets or result in attempts to "isolate" them from other aircraft at airports.

The main problems are those of noise and blast. The real menace of the problem of jet noise lies in the inconvenience to residents living in the vicinity of airports and strenuous efforts are bing made by manufacturers to develop mufflers to reduce the noise level to that of the larger piston-engined airliners currently in service. There is every reason to believe that these efforts will be successful, and it is encouraging to note that the Port of New York Authority have recently approved the Comet 4B, fitted with the Greatrex silencer, for operation into the New York airports. So far as the internal problem is concerned, one can reasonably expect that passengers will not object, because the effect on them will be of short duration and people will tolerate certain inconveniences if they are deriving a corresponding advantage. Terminal buildings will, however, need to be sound-proofed and fully air-conditioned so as to reduce noise to a tolerable level and to provide acceptable working conditions for staff employed in the offices and on counters in the building.

(*Continued on page* 813)

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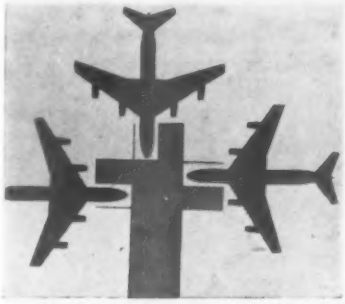


Possible nose-dock arrangement for a conventional two-level finger. Passengers would embark and disembark through the forward aircraft door and pass, via an adjustable platform, directly into or out of the terminal.

(*Continued from page* 812)

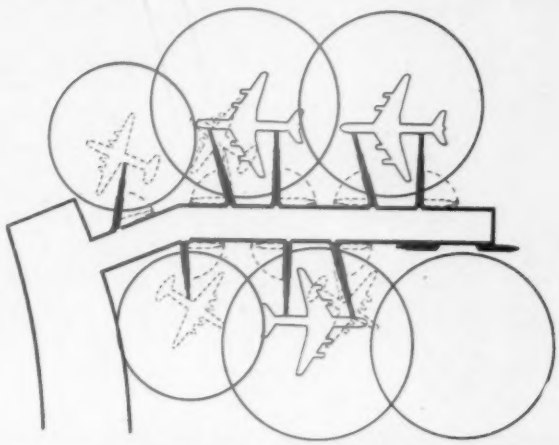
On the apron itself a combination of blast fences, control of passenger movement between aircraft and gates, and disciplined pilot technique in manœuvring jet aircraft should overcome most of the difficulties associated with blast.

Additionally, ways and means are being considered for protecting passengers from exposure to noise and blast on the apron and at the same time accelerating the embarkation process. American Airlines, for example, are considering a "nose dock" system for handling jets. These docks would be located mainly at the extremities of fingers at airports, but could also be positioned at intervals on both sides of a pier. If the pier is a two-level design, passenger stairs would be eliminated and passengers could disembark directly from the aircraft on to an adjustable platform and proceed to the terminal building. The main disadvantage of this system is that it requires some independent towing device to move the aircraft in and out of the nose dock. The alternative to a towing vehicle is some form of mechanical transfer system, installed flush with the apron, which would move the aeroplane clear of the building to a point where it could taxi under its own power. Experience so far with mechanical transfer systems does not encourage one to feel that they have yet been sufficiently developed to provide the answer.

There is, however, an alternative scheme which may offer a more acceptable solution. This is known as the Aerobridge and is being developed by Lockheed Air Terminals for United Air Lines. A prototype installation has recently been on trial at O'Hare Field in Chicago. This remarkable device consists of a covered bridge which will extend from the second storey of a terminal building or pier directly to the rear door of the aircraft. The enclosed metal walkway is in three telescopic parts which permit the bridge to be extended from 55 to 107 ft. It is electrically powered and can be operated by one man.

As a supplementary device, Lockheed have designed a monorail nose-loading gangplank, specifically for passenger loading by the forward entrance doors. This can be described as a small "cabin," suspended on a monorail running along the face of a pier or building, which can be propelled forwards to make contact with the forward loading door of a parked aircraft. After the aircraft is in position, an Aerobridge can be swung out to provide access to the rear door, thus permitting simultaneous loading and unloading. The use of the monorail means, however, that the aircraft must approach the building at a 90° nose-on angle and requires the aircraft to be towed out.

This system has, therefore, very similar disadvantages to those which I enumerated in connection with the air-dock. Using the Aerobridge only, without the monorail supplementary device, aircraft can taxi in and out under their own power and, if parked in a position parallel to the pier, two Aerobridges can be used to provide simultaneous access to the aircraft. Apart from passenger convenience and a reduction in the clutter of vehicles and equipment on the apron—which are both important advantages—the Aerobridge is an expensive and rather massive piece of structural engineering and the cost factor would have to be considered carefully before any decision could be taken to adopt it.



How the "Aerobridge" or "Aero-Gangplank" might be arranged for simultaneous loading and unloading.

Both the air-dock and the Aerobridge offer possibilities for expediting the handling of baggage and cargo. All airlines are agreed that baggage handling on arrival remains high on the priority list for improvement. It is not much use if, after hurrying ashore or getting through the controls quickly, the passengers find that they have to wait a long time for their baggage, either in the Customs Hall or the baggage-claim area. The passenger devices I have described would leave the ground-level areas around the aircraft free of obstruction, so that unloading can take place immediately. The possibility of using mechanical conveyance systems are, therefore, greatly enhanced. The mechanical conveyors could deliver the baggage either to a Customs Hall for examination, or, at a terminal handling domestic traffic, to a baggage-claim area where a diverter unit,

The prototype "Aero-Gangplank" installation which has been on trial by United Air Lines at O'Hare Field, Chicago. It has been developed by Lockheed Air Terminals for United.

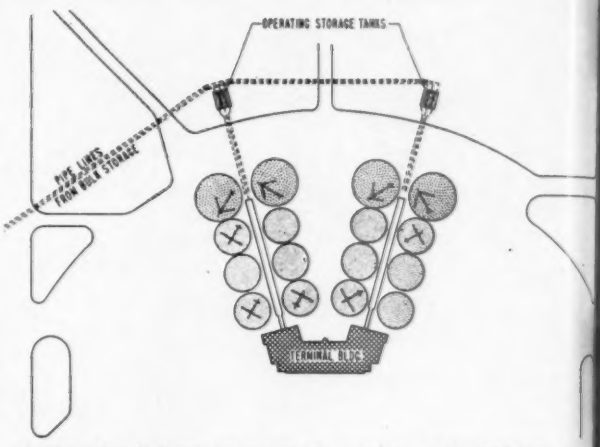
Airport Equipment and Installations . . . .

operating on the electric eye principle, would automatically deliver baggage at a suitable spacing on to a sloping counter where it could be self-claimed by the passenger.

Without going into a comparative analysis of the merits and demerits of tanker and hydrant refuelling systems, there is a good case for preferring hydrant systems for refuelling turbine aircraft at major airports where the frequency of refuelling operations would justify the capital outlay. The hydrant system would materially reduce the serious and growing problem of the clutter of apron vehicles—always a potential hazard to life and limb and a frequent source of damage to aircraft. The elimination of fuel tankers would facilitate the loading and servicing of aircraft and lead to greater efficiency and—a vital point—to quicker turnrounds.

There is nothing new or untried about the underwing hydrant refuelling of jet aircraft. More than five years ago hydrant systems were constructed at Le Bourget, Casablanca, Dakar and Cairo, and Comets were successfully refuelled at these points by means of the hydrant method. By using satellite or operating storage tanks, the tanks and pumps can be located close to the aircraft stands so as to reduce shock pressures, pipeline and pump sizes, and to cut costs. An operating pressure of 35 p.s.i. will give a delivery rate of 300 gallons for each of four underwing connections, or a total of 1,200 gallons per minute to the aircraft—an important factor in reducing ground times for the short-haulers.

The problem of the different positions of underwing refuelling points can be overcome by accurate manœuvring into the parking position and by the use of either self-propelled or hand-drawn dispensers. These dispensers are the connecting link between the hydrant outlets and the aircraft and carry the hoses, meters, filters, flow-regulators and surge-suppressors.



A plan of a hydrant system which could be used with pier standings. Turbojet aircraft would occupy the end positions.

A hydrant refuelling system using operating storage tanks can serve effectively aircraft parked at piers in the terminal area. The ducts for the pipeline could also be utilized for providing other fixed installations, such as water, power and telephones.

I have stressed earlier the importance of treating the planning of ground facilities for airline operations as an integrated whole. This is too wide a subject to be dealt with in a single article and covers the whole range of airport planning, refuelling operations, the design of aircraft holds and loading facilities, airline handling systems, Governmental control procedures and, last but by no means least, the method of conveying passengers between the centre of a city and the airport.

The picture, below, shows the layout of New York International. Around the island the individual carriers are building their own unit terminals while arriving international and all foreign flag passengers use the new terminal in the left foreground.

London's New Airport

1.—The Background

THE history of the post-war plans for the development of Gatwick Airport has been among the stormiest concerned with public enterprise of any kind. First used as an aerodrome in 1930 and initially developed for full-scale use in June, 1936—enjoying then the distinction of having a most original and sensible circular terminal building (the "beehive") with the small beginnings of a modern "finger" or "pier" system—Gatwick was used by British Airways in its early days.

Since then, and until the re-development decision was made, it had enjoyed a fairly quiet requisitioned life (except for the 1941-43 era), and even as recently as 1949 the Government of the day was assuring all and sundry that there were no plans for its fuller use. Gatwick was due to be derequisitioned in September of that year, but the decision was not confirmed.

The plan to make full use of the Gatwick site—or, rather, to lay out a new aerodrome to the north and west of the original site—had been quietly developing in the minds of the operational and administrative staff at the (then) Ministry of Civil Aviation for some time before the decision was announced by the Minister in July, 1952.

Those with eyes to see (and time to use them) might have noticed, in the Civil Air Estimates earlier that year, a mysterious little figure of £5 million for future "works and buildings" expenditure at Gatwick. Obviously a decision had already been made by the Ministry and awaited a politically ripe moment for promulgation. The new Gatwick, as a second airport for London, had become a "must" in the minds of those whose job it was to plan for air transport's future. They knew that London Airport's capacity was limited by the inexorable problems of air traffic control and apron area—just as they know now that a third major airport for London will probably be needed by 1965.

After the announcement of the decision there was something of an hiatus and it was then that local authorities and individuals began to show signs of a higher blood pressure. Not unnaturally, owners and prospective owners of property wanted to know which way the extensions would lie, and resistance committees were formed.

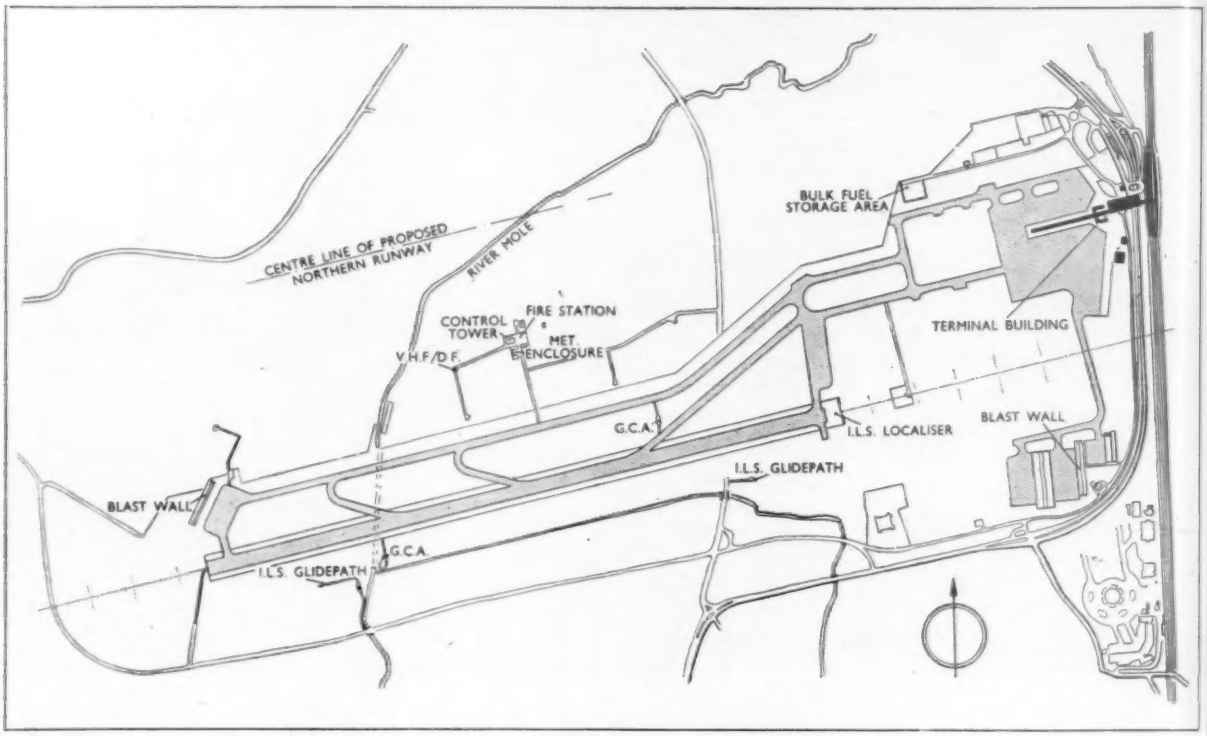
The first detailed plan for the development was announced in October, 1952. The resistance movements then had something on which to work and the impetus began to develop. This original plan was slightly modified and the details of the changes were published in July, 1953. The planned positions of the runways were shifted west (farther away from the railway embankment) by about half-a-mile and their orientation was swung five degrees anti-clockwise. For various reasons it had been decided, too, that the southern instead of the northern runway would be the first to be laid down.

During that same month (July, 1953) a White Paper ("London's Airports," Cmd. 8902) was published. This outlined the reasons which had led the Ministry to decide on Gatwick as the only site which met "substantially" all the requirements for an additional airport for London. At that time Northolt was still in use as a civil airport, but it had already been decided that this was too near to L.A.P. and that the civil operations must be moved to the main airport. The White Paper

OLD AND NEW.—In the picture on the right the 1936 "beehive" terminal building at Gatwick is seen against a background of the diverted Brighton road and the new terminal area. At the top of the page is an aerial view of the new terminal building. A picture of the whole airfield appeared in last week's issue (p. 766).

Photographs copyright "The Aeroplane"

Airport Equipment and Installations . . . .



A plan of Gatwick showing the layout of the first stage of its development. The original terminal area is in the bottom right hand corner.

concluded, in fact, that three airports were needed for London—L.A.P., a new main airport (for seasonal services and diversions) and Blackbushe (for diversions).

The possible sites for a new airport examined by the Ministry included Gatwick, Blackbushe, Dunsfold and Stansted as the "best four candidates." Others were the R.A.F. aerodromes of Biggin Hill and West Malling, Bovingdon, Croydon, Fairlop (the City of London's old airport site), Fair Oaks, Luton and Penshurst. The Ministry even considered Lasham (Hampshire), which is 45 miles from London.

The final choice of Gatwick as the new airport and main alternative was based on the facts that it was near the busier air routes to and from London, yet sufficiently far from L.A.P. to keep mutual interference of operations to a minimum; that it was on a main-line railway with a good service; and that its weather, "while intrinsically no better" than that at the other sites, was sufficiently unlike that at L.A.P. to make it suitable, normally, for use as an alternate.

Objections to Blackbushe were concerned with intractable air traffic control problems—the result of the nearness to Farnborough, with its essential experimental and other flying, of its position in the traffic pattern west of L.A.P. and of the nearness of another aerodrome. Though considered to be impracticable as a secondary airport for London, Blackbushe was considered to be "suitable as a supplementary aerodrome for use by the relatively small amount of traffic from the north and west."

None of these considerations had much influence on the protesting local public, and even those who agreed that the Gatwick plan was the only practical one were aware of an uncomfortable feeling that this scheme was being, so to speak, bulldozed through. A public inquiry was held between March 16 and April 8, 1954, and the report on the findings (Cmd. 9215) was issued in July of that year.

The terms of reference for the inquiry did not leave much room for manœuvre, since objections to the development of Gatwick only were being considered—and not questions concerning the need to provide an alternate to L.A.P., or the means by which this need should be met. However, the objectors were permitted to suggest detailed modifications to the Gatwick scheme.

A good case for the choice was made at the inquiry by the Ministry and others, but the objecting bodies and individuals were also given ample opportunity to state their complaints and the chairman stressed and commented on all the more valid objections. Nothing in the report of the inquiry caused official second thoughts about the scheme and the decision to proceed with the revised plan was announced in October, 1954—with a target of spring, 1958, for the completion of the first-stage plans.

2.—The Pattern of the Airport

These plans involved civil engineering work of no mean magnitude—such as the diversion of the Brighton road and the taming and culverting of the River Mole—but Gatwick also provided its designers with an opportunity to make an airport and its terminal facilities up to date by experienced mid-1950 standards. Whereas London Airport had necessarily been designed on somewhat theoretical bases, Gatwick could enjoy the advantage of about a decade of post-war air transport experience.

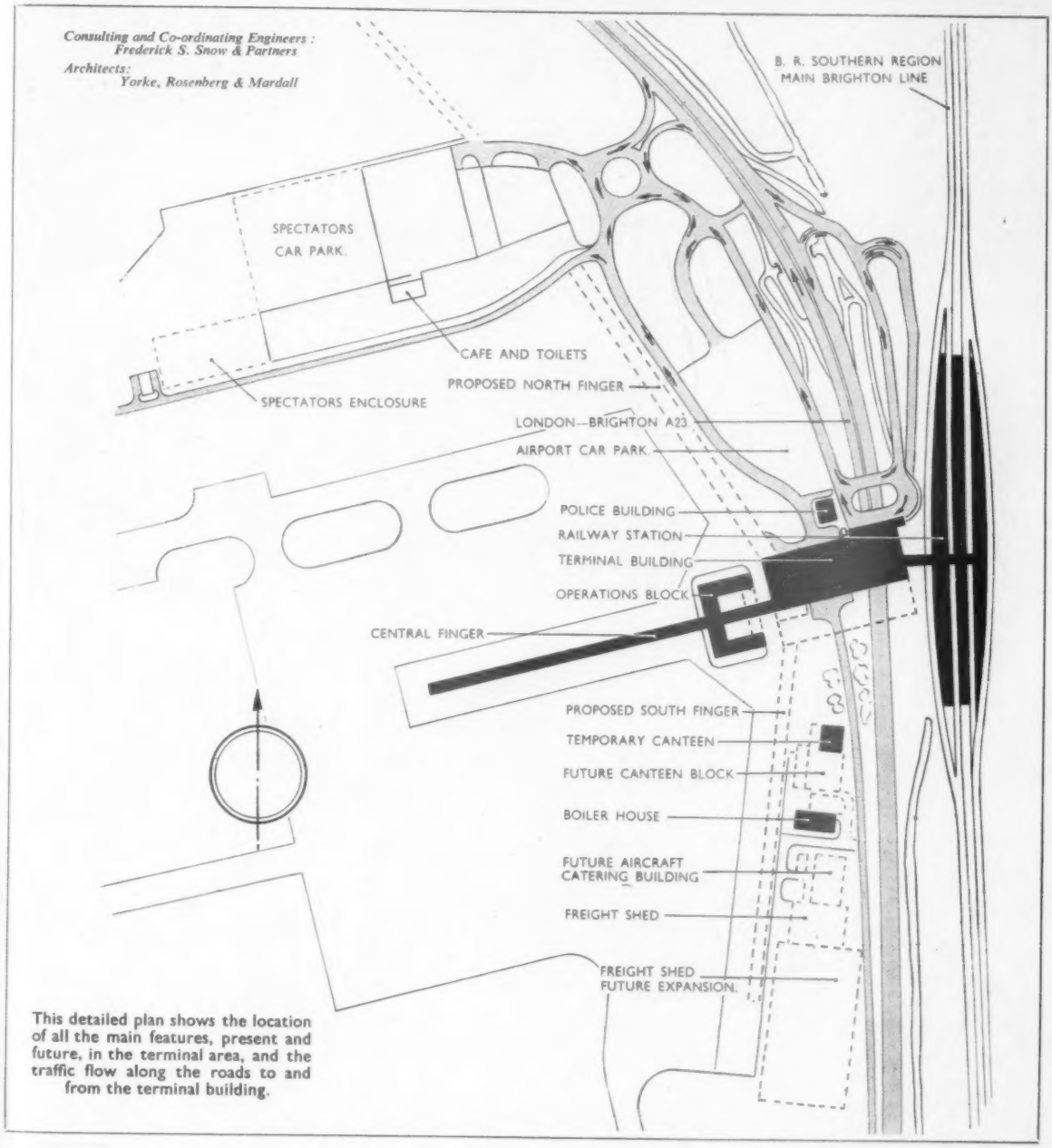
Coupled with the changes in aircraft configuration and performance—making cross-wind landings less of an obvious difficulty—this experience has produced an overall airport design which is, by older standards, starkly simple. The first stage of Gatwick's development—which may well be adequate for several years—involves a single runway (with parallel taxi-track and fast turn-offs); a large apron area; a relatively simple "straight-through" terminal building; a single long "finger" or "pier" around which the arriving and departing aircraft will stand; a maintenance area which is well away from the terminal centre; and a control tower which is on its own half-way down the runway and placed so that it lies between the present runway and the site of a projected future parallel runway.

The first-stage terminal building is, in fact, the northern half of the total plan—hence the way in which the single pier sprouts asymmetrically from the end of the building. A second pier can be built out to the north-west from the present terminal, but a third pier must await the completion of the building. This completion will involve the erection of a "matching" second half for the three-floor terminal and of a column-supported office block of five floors lying transversely (north and south) across the building.

The arrangement of the terminal building can best be

(Continued on page 817)

Airport Equipment and Installations . . . .



This detailed plan shows the location of all the main features, present and future, in the terminal area, and the traffic flow along the roads to and from the terminal building.

(*Continued from page* 816)

understood by looking at the cut-away perspective drawing on pages 818 and 819 and at the detailed plan of the road and rail network in the terminal area. The philosophies behind its design may be explained by quoting from the architects' comments in an M.T.C.A. statement. These commenis are a trifle dramatic and grandiose, but they make their points.

"There is a monumentality about the large spaces, but no pomposity. Large numbers of people will feel neither cowed by size nor crushed by any meanness of scale. . . . The drama of travel by air has been exploited. The long pier is fully glazed so that passengers can get a view of the aircraft waiting for them on the apron—making an informal and friendly thing of air travel. The bustle and noise of the concourse is its character, and nothing has been done to make it cosy. Those who wish to have time to escape from this can climb the main stair up to the buffet and bar. The restaurant, overlooking the whole airport, will be calm and luxurious."

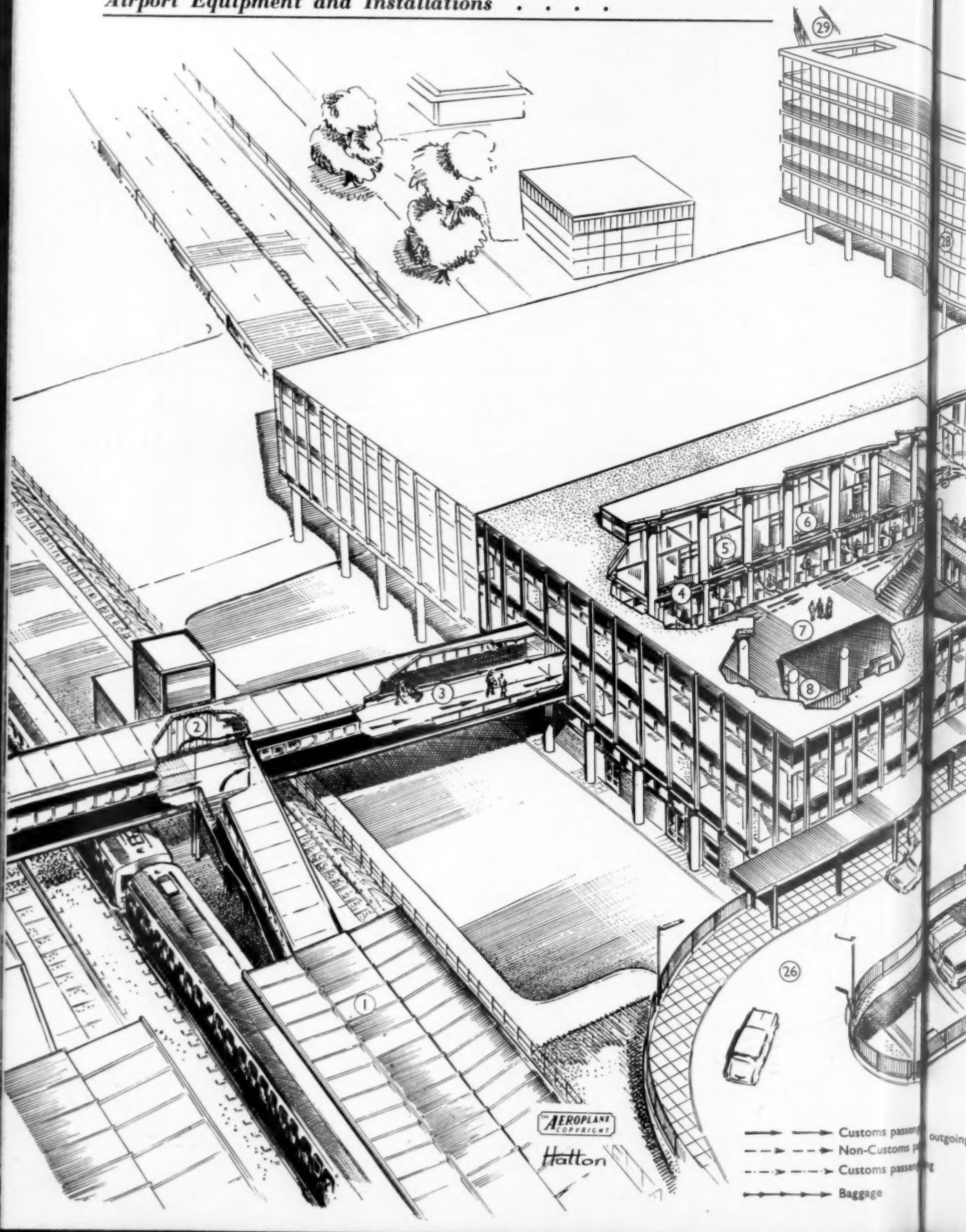
As will be seen from the perspective drawing, passengers arriving by rail at the reconstructed Gatwick Racecourse station climb upstairs and cross a footbridge into the terminal at the first-floor (concourse) level; their baggage will, if necessary, be taken up by a lift. Passengers arriving by road drive up a ramp to this level. Here in the concourse are the airline offices, counters, and concessions; at the western end of the concourse, on the next floor, is the lounge, bar, buffet and restaurant.

On outward overseas journeys the baggage is spot-cleared by Customs at the desks, so passengers are normally free to do as they please until called. They have their passports checked on their way out along the pier. This pier is divided laterally at first-floor (or, in fact, mezzanine) level into Customs and non-Customs passages. When travelling on a domestic flight passengers will proceed directly to the right-hand passageway, along to the appointed gate and down steps to apron level. When travelling on an overseas flight they will be directed so that they walk along the left-hand passageway in the pier.

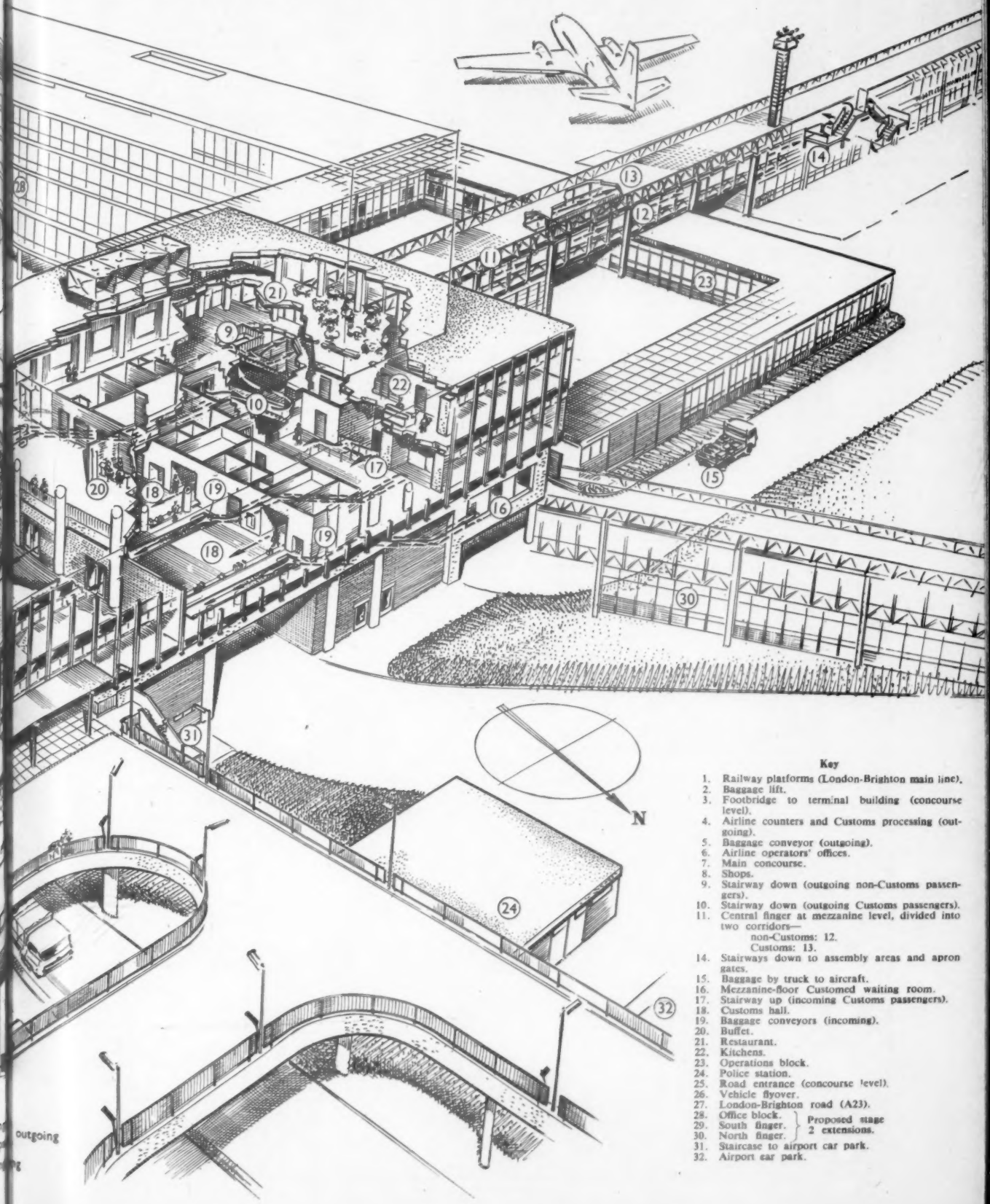
Incoming domestic passengers can pass straight through the

(*Continued on page* 820)

Airport Equipment and Installations . . . .



London's New Terminal



Key

1. Railway platforms (London-Brighton main line).
2. Baggage lift.
3. Footbridge to terminal building (concourse level).
4. Airline counters and Customs processing (outgoing).
5. Baggage conveyor (outgoing).
6. Airline operators' offices.
7. Main concourse.
8. Shops.
9. Stairway down (outgoing non-Customs passengers).
10. Stairway down (outgoing Customs passengers).
11. Central finger at mezzanine level, divided into two corridors—
    non-Customs: 12.
    Customs: 13.
14. Stairways down to assembly areas and apron gates.
15. Baggage by truck to aircraft.
16. Mezzanine-floor Customed waiting room.
17. Stairway up (incoming Customs passengers).
18. Customs hall.
19. Baggage conveyors (incoming).
20. Buffet.
21. Restaurant.
22. Kitchens.
23. Operations block.
24. Police station.
25. Road entrance (concourse level).
26. Vehicle flyover.
27. London-Brighton road (A23).
28. Office block. } Proposed stage 2 extensions.
29. South finger. } Proposed stage 2 extensions.
30. North finger. } Proposed stage 2 extensions.
31. Staircase to airport car park.
32. Airport car park.

Airport Equipment and Installations . . . .

(*Continued from page* 817)

terminal after walking along the domestic side of the pier, but Customs passengers will cross the end of the building and enter through the Customs and Immigration halls at concourse level.

Outward baggage is taken by conveyors from the airline desks to the baggage-handling area at ground-floor and thence by truck to the aircraft. Inward baggage is trucked to the baggage area and thence by conveyor either to the concourse or the Customs hall to await collection.

At ground-floor level on the pier side of the terminal there is an operations block—which is actually a series of offices arranged in a square around the pier. Here there are the usual meteorological and crew briefing offices and crew assembly rooms. At ground level the pier consists of offices and such rooms as those which are necessary for the apron marshalling staff and engineers. Above the pier is an apron control tower.

Now for some of the practical and operational features of Gatwick.

3.—Air Traffic Control

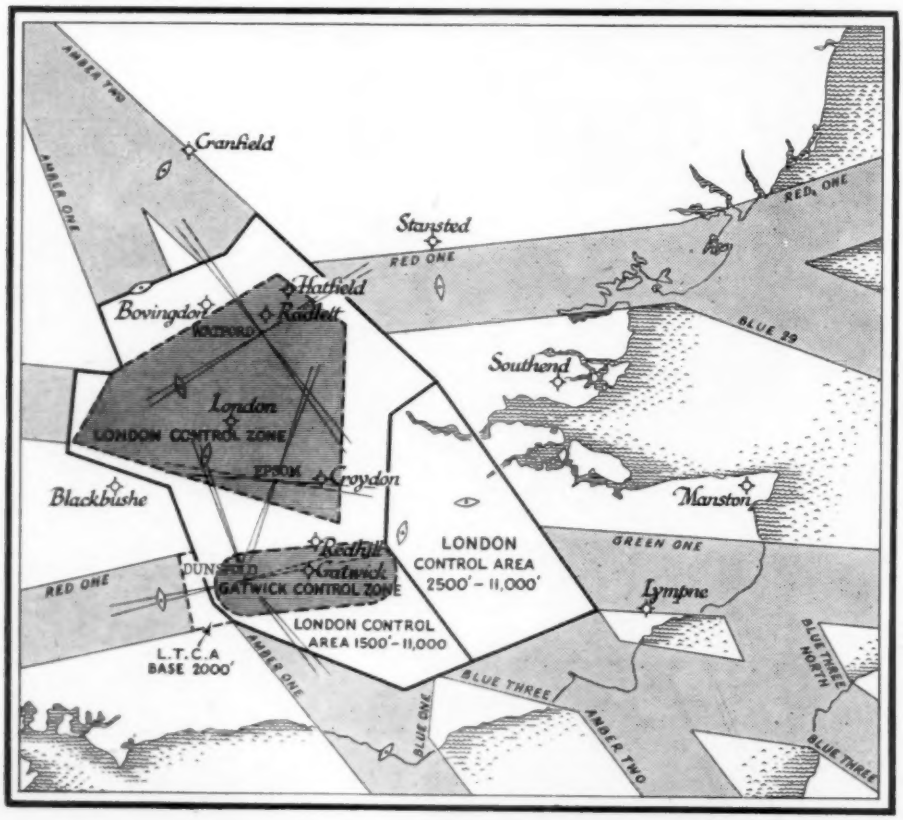
The control tower is a simple functional building situated to the north of the runway, which can be seen by the controllers from end to end—though they cannot see the terminal and apron area. The building has four (in fact, four-and-a-half) floors, with the aerodrome controllers at the top, the approach and radar controllers below and the telecommunications room on the ground floor. The "half-floor" is in the tower proper, which is at two levels—one for the aerodrome controllers and the other for the radar controllers. At present this radar floor has only one operator's position, but eventually, when daylight-viewing equipment is available, the radar and the approach control staff will move up from the third floor—where they now work in artificial light—to the top of the building.

A standard ILS, consisting of dual localizer, glidepath, middle and outer markers and compass locator beacon, has been installed on the basis of one complete installation for each landing direction. In addition PAR has been installed and at present this consists of a mobile GCA equipment with displays in the airfield vehicle. This is scheduled to be replaced in due course by PAR consisting of a mobile aerial head with displays in the approach control room.

Two completely separate surveillance radar systems have been provided—a Cossor ACR Mark 6 and a Marconi S232—which, with PAR, offer a complete GCA system. The ACR is a high-power search radar designed to provide short- and medium-range cover on the approaches. Moving target indication (MTI) eliminates permanent echo clutter from the duplicated displays.

(*Continued on page* 821)

The control tower at Gatwick is of severely functional design and is placed so that the controllers have a view of the entire runway—and of the possible future runway to the north.



This plan shows the position of the Gatwick control zone within the London control area and the layout of the revised airway system. To avoid confusion, non-directional beacons and military-use aerodromes in the area have been omitted from the drawing.

Airport Equipment and Installations

(*Continued from page* 820)

So as to reduce returns from clouds and rain, circular polarization is incorporated; this discriminates in favour of an aircraft echo. Electronic "video mapping" is provided to mark key holding points and the approaches to the runway.

The S232 radar has also been designed to provide surveillance radar cover at short and medium ranges and provides an alternative service to the Cossor equipment. Moving target indication is provided and, working at a lower frequency than the ACR Mk. 6, there should be little or no clutter from rain returns on the duplicated displays. These are of the "table top" type and are mounted in a stand which permits two consoles to be located one above the other, providing displays from either equipment as required.

Gatwick has the first installation of multi-channel magnetic tape recording equipment which M.T.C.A. are introducing into service to replace the single-channel embossed-film type of recorder which is at present in use. This equipment, which will initially record seven channels on a single tape, is capable of expansion to accommodate up to 15 channels. The recording duration is eight hours.

The increase in message traffic and the need for speedier teleprinter-message handling has compelled the Telecommunications Directorate of the Ministry to conduct a critical examination of the U.K. civil aviation teleprinter network. After these investigations it was decided that all existing and future signal centres should be equipped with semi-automatic teleprinter message exchanges. Gatwick is the first centre to be equipped with a fully electronic, magnetic-drum storage, push-button teleprinter exchange which is known by the manufacturers as STRAD (Signal Transmitting Receiving and Distribution System). The STRAD handles traffic between local airport extensions at Gatwick and several trunk routes.

4.—Runways and Lighting

As might be expected, Gatwick has a number of new and special lighting and runway-marking features, some of which are shown in the diagrams on this page.

The familiar Calvert line and cross-bar approach lighting system, first installed at London Airport and now internationally accepted, extends for 3,000 feet beyond the runway at each end. In good weather it shows a pattern of red lights, visible in all directions, along the extended centre-line of the runway, intersected by two cross-bars. In poor visibility the pattern is changed to a line and five cross-bars of much brighter white lights beamed towards the approaching aircraft.

Down either side of the runway the edge of the concrete is marked at 200-ft. intervals by a line of omni-directional white lights. In poor visibility much brighter lights, beamed towards the aircraft, are brought into use. A line of green lights runs across each end of runway to mark the threshold, with a 75-ft. gap in the centre. The location of the threshold is emphasized by a "wingbar" of four green lights on either side, and 1,000 feet along the runway from the threshold there are similar white, high-intensity "wingbar" lights. These "wingbars" will help the pilot to judge his angle of descent and to touch down between the two sets of lights.

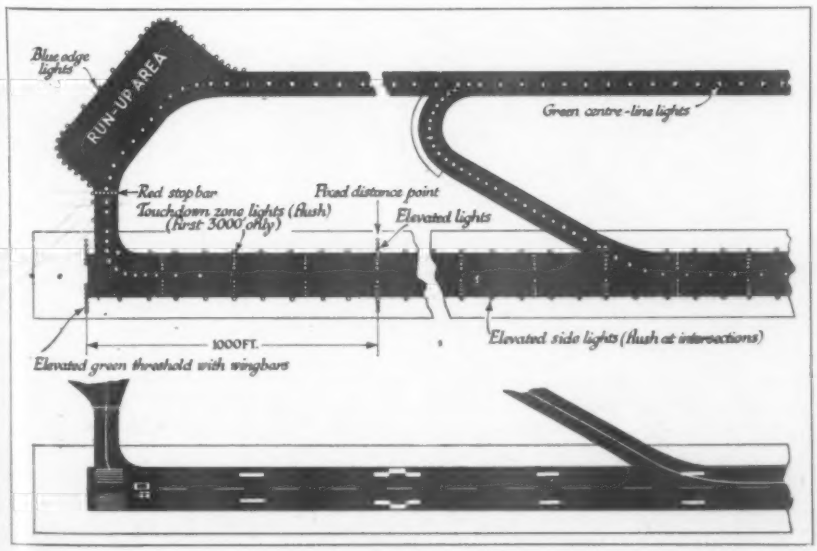
In the tower at Gatwick—a picture taken a few days before the official opening. In the foreground are the lighting control panels. Behind the aerodrome controllers is a lower-floor area which will eventually be used by both the approach and radar controllers.

For a long time pilots have complained about the fact that, on nearing the threshold, they seem to run into a pool of darkness as the approach lights disappear beneath the nose. Brightening the runway lights may only make matters worse—particularly in mist or rain. As a result of full-scale experiments an entirely novel form of inset lighting has been installed for the first 3,000 feet of runway at Gatwick. The runway is kept clear of all lights along a 75-ft.-wide central strip corresponding with the gap in the threshold lights, but on either side short transverse bars of four lights, set in the runway at 250-ft. intervals, help to illuminate the touch-down zone.

The single 7,000-ft. east-west runway is 150 feet wide and of concrete construction with a dark grey surface. It has one entirely novel feature — 75-foot-wide paved "shoulders." These are of flexible construction, but strong enough to take the occasional load of any aircraft which may run off the concrete and they are surfaced with reddish granite chippings. The shoulders continue across, and for 200 feet beyond, each threshold. In addition to threshold and centre-line markings, touch-down zone markings, extending 2,000 feet from each end of the runway, give emphasis to the fixed-distance point which is 1,000 feet from the threshold in use. Cleared areas more than 900 feet in length have been provided beyond each threshold.

Except for an area lying across the western approach, and 1½ to three miles from the airport, the instrument approach surface (a slope of 1 in 50 as recommended by ICAO) is not infringed. In the area mentioned the minor infringements are marked by flashing red beacons.

The fast turn-offs from the runway to the taxi-way allow aircraft to leave the runway at speeds of up to 50 knots and thus permit an uninterrupted traffic flow. The apron provides parking for 11 aircraft around the pier or finger, and a further seven stands along the line of the future northern and southern fingers. Three "island" stands, capable of taking larger aircraft, are provided at the southern side of the apron.



Gatwick's runway has the latest in the way of markings and lighting. Daylight-use marking is shown at bottom (note the "fixed-distance point" marking) and the night lighting system is shown above. There is a Calvert approach lighting system for each end of the runway. The touchdown zone and wingbar lighting are new conceptions which are described in the article.

Airport Equipment Suppliers

Radio and Radar

British Communications Corpn., Ltd., Exhibition Grounds, Wembley, Middx. (Wembley 1212)

Communications VHF equipment and electronic measuring apparatus is developed and manufactured. The first of a new series of magnetic tape-recording equipment made by B.C.C. is installed at Gatwick Airport, and later will be at all principal M.T.C.A. airports. These installations of the Multichannel Automatic Recording System will replace the film-type recorders originally used by A.T.C.

Burndept, Ltd., West Street, Erith, Kent. (Erith 3080)

Manufacturers of radio-telecommunications VHF and UHF equipment; electronic and nucleonic equipment; dry batteries of all types for service equipment.

Cossor Communications Co., Ltd., Cossor House, Highbury Grove, London, N.5. (Canonbury 1234)

Manufacturers of radio-communication equipment.

Cossor Radar and Electronics, Ltd., Cossor House, Highbury Grove, London, N.5. (Canonbury 1234)

Two primary radar equipments, the A.C.R. VI and the C.R.21, are being produced for airport use. Both are high-power surveillance units operating in the "S" band.

The A.C.R. VI (Airfield Control Radar Mk. VI) is designed to give radar coverage of an airfield and its approaches up to 25-60 nautical miles, according to aircraft type. Its design renders it suitable for use independently of any other radar, or it may be used in conjunction with a precision-approach radar (PAR) to form a complete GCA system. This radar is installed at Gatwick Airport.

The C.R.21 (Cossor Radar type 21), available in both static and mobile forms, is smaller and has been supplied to Commonwealth and European countries.

Decca Navigator Co., Ltd., The, 9 Albert Embankment, London, S.E.11. (Reliance 8111)

Although this company does not manufacture airport equipment as such, their Decca and Dectra radio navigation equipment are of steadily growing importance. Decca, in its Mk.10 form, is to be B.E.A.s standard primary flight aid and transmitting chains are now also in use or on test in North America.

Decca Radar, Ltd., 9 Albert Embankment, London, S.E.11. (Reliance 8111)

Makers of airfield control radars; air surveillance, Q-band, storm-warning and defence radars; radar links; wind-finding radars; and specialist air and marine radars.

Newly introduced is a high-performance civil air-surveillance radar, type D.A.S.R.1, an 800-kW 10-cm. equipment. The actual performance against a target of 24 sq. m. equivalent reflecting area is continuous and gap-free from 10 miles to 135 miles at 50,000 ft. A two-beam aerial system is used, each being fed with 800 kW from separate transmitters.

Besides showing the normal radar picture the displays used with the type D.A.S.R.1 have provision for the electronic presentation of additional information.

Ekco Electronics, Ltd., Ekco Works, Southend-on-Sea, Essex. (Southend 49491)

Makers of radar, communication, direction-finding and airfield-approach equipment. One of the newest products of this company is a simplified radar approach aid for one-man operation at smaller airports.

The basis of the design of the equipment, which operates from AC mains, is the combination of a 3-cm. radar installation with a VHF D/F system, the radar dish being mounted on a common rotatable shaft with the D/F aerial, so that the axis of the beam coincides with the null direction of the D/F aerial. The radar dish is independently controllable in elevation, but is permanently coupled to the D/F aerial in azimuth. The radar display is an "A" scope presentation, calibrated in nautical miles in two ranges, 0-4 miles and 0-16 miles. Two scales are arranged to show the elevation angle of the radar dish and the azimuth angle of the D/F aerial and radar dish. A separate VHF transmitter/receiver is provided for giving pilots the necessary approach instructions.

International Aeradio, Ltd., Aeradio House, 40 Park Street, London, W.1. (Hyde Park 5024)

The activities of this World-wide organization include the engineering, management and operation of air traffic control, radio and associated systems, the training of airport staff and the production of route manuals, maps and charts. Best-known of the published work is that on the *Aerad Flight Guide*. Typical of the practical work of I.A.L. is the design and production of air traffic control consoles—of which 142 have now been installed in 28 countries.

The latest series of orders is from the Belgian Congo, following trials of one installation at Luluabourg Airport in 1956. The main console is for Leopoldville and is of a new L-shaped design with all the facilities and controls concentrated on various standard-size panels.

Marconi's Wireless Telegraph Co., Ltd., Marconi House, Chelmsford, Essex. (Chelmsford 3221)

As might be expected, Marconis are responsible for a very wide range of radar, communications and ADF equipment. Communications systems include many types of VHF ground-to-ground and ground-to-air sets; radars include equipment for surveillance, storm-detection, airfield control and height-finding; and the latest ADFS are the AD.210 series with remote master control and indicator display units, which can, when required, be incorporated in a control desk, and have provision for a slave display unit.

The latest Marconi equipment is the Automatic Fixer for use with VHF/DF. This offers direct presentation of a fix on a 17-in. C.R. tube with a translucent map of the control area superimposed on the tube. Presentation is by intersecting lines from two or more DF stations. Up to six position lines can be displayed on one or more frequencies, and radar identification service can also be provided.

Murphy Radio, Ltd., Broadwater Road, Welwyn Garden City, Herts. (Welwyn Garden 3434)

Radar, communication and navigational equipment for aircraft and ground use is produced. One of the latest products is the MR 880 VHF radio telephone, suitable for ground-to-air communications. It is an amplitude modulated VHF transmitter-receiver designed to operate as a fixed-base station for one or more of the company's range of single- or multi-channel mobile RT units. The equipment gives an r.f. power output of up to 25 W over the frequency range of 60 to 174 Mc/s and provides for five adjacent channels working with remote and/or extension-control facilities if required. The entire equipment is self-contained, and good siting of the aerial can give a reliable coverage of more than 600 sq. miles.

Plessey Co., Ltd., The, Vicarage Lane, Ilford, Essex. (Ilford 3040)

Designers and manufacturers of airport and airborne communications equipment; electronic instruments, computers and precision engine-speed indicators; rotary transformers; generators; actuators; switchgear; starting systems and motors.

Pye, Ltd., Newmarket Road, Cambridge. (Teversham 3131)

In a wide field of electronic engineering the principal aviation work of Pye is concerned with communication equipment and on the developed ILS installation, which is now in full production. Newest in communications equipment is a 1-kW VHF transmitter, the PTC 3600, designed primarily for airport ground-to-air operations. The ILS system meets the rigid ICAO performance specification.

Racal Engineering, Ltd., Western Avenue, Bracknell, Berks. (Bracknell 941)

Racal designs and makes communication equipment, the latest of which are the RA.17 HF receiver and the TRA.55 low-power radiotelephone.

Redifon, Ltd., Broomhill Road, London, S.W.18. (Vandyke 7281)

Makers of MF, HF and VHF radio communications and navigational-aid equipment for airfields and airports, including transmitters, receivers and radio beacons. Audio equipment for airport and aircraft announcement systems.

Standard Telephones and Cables, Ltd., Connaught House, 63 Aldwych, London, W.C.2. (Holborn 8765)

In addition to a range of telecommunications, ground and airborne communications, and navigation equipment, S.T.C. has recently developed a Signal Transmitting, Receiving and Distribution System (STRAD). This is a semi-automatic teleprinter for message exchanges which has been specially developed to reduce manual handling to a minimum.

The first installation of STRAD is at Gatwick Airport, where it will be used to handle traffic between local airport extensions and several trunk routes to London Airport, the National Signal Centre at Croydon and the Cross-Channel Signal Centre at Lympne.

The Gatwick installation has been designed to an M.T.C.A. specification and will perform all the functions of a manual relay centre. Message-handling time has been reduced to a minimum by using a magnetic drum for temporary storage and re-transmission is automatic. Traffic handled by the STRAD system consists of messages to and from other stations at home and overseas, such as flight plans, departure plans, meteorological reports, flight regularity messages, and so on.

Ultra Electric, Ltd., Western Avenue, Acton, London, W.3. (Acorn 3434)

This company produces servicing units for aircraft communication equipment; engine controls; and radar simulators.

A typical air traffic control desk by International Aeradio.

Ground Equipment

Access Equipment, Ltd., Braemar Avenue, Neasden, London, N.W.10. (Gladstone 8283-4)

Two types of adjustable mobile working platforms and an air-freight lorry loader are made by Access Equipment. The Giraffe hydraulic platform is for working heights of up to 40 ft. and the Safety Raiser adjustable platform for heights up to 20 ft.

Aero Maintenance Equipment, Ltd., 100A Clapham Park Road, London, S.W.4. (Macaulay 2477) and (Works) Derwent Mill, Cockermouth, Cumberland (Cockermouth 2326-7)

Manufacturers of aircraft handling and hydraulic jacking equipment, and covers for all types of aircraft and engines.

Air Service Training, Ltd. (Aircraft Division), Hamble, Southampton. (Hamble 3001-9)

A.S.T. design and manufacture aircraft-toilet servicing equipment to meet all requirements. Six types are now in production.

The Mk. 5 toilet-servicing unit has been built to a B.O.A.C. specification and the latest project, designed in conjunction with the Corporation, is intended to service larger transport aircraft such as the Britannia.

A variant of the earlier Mk. 4 unit, the Mk. 4A has also been produced and incorporates a higher-capacity electric pump giving an output of about 720 gal./hr. at 10 ft. 6 in. head, making this unit also suitable for use with the Britannia.

A Conveyancer TC-6 Diesel/petrol fork truck operating at Ringway Airport.

Austin Crompton Parkinson Electric Vehicles, Ltd., 95-99 Ladbroke Grove, London, W.11. (Park 8070)

Manufacturers of Morrison-Electric battery-driven commercial vehicles. In collaboration with Fourways (Engineers), Ltd., battery-operated mobile conveyors with variable-height hinged booms are produced. These are available on standard 20-cwt. or 30-cwt. chassis for aircraft freight loading.

Auto Diesels, Ltd., Cowley Mill Road, Uxbridge, Middx. (Uxbridge 8262)

This company manufactures petrol- and Diesel-engined generating sets; Crompton Parkinson Auto Diesels for jet-aircraft starting units; and ground servicing equipment for all types of aircraft.

Avery-Hardoll, Ltd., Oakcroft Road, Chessington, Surrey. (Elmbridge 5221-7)

Fuelling equipment developed by Avery-Hardoll includes high-level shut-off valves for storage tanks, pressure-refuelling equipment for hydrant installations, quick-release valves and self-sealing couplings, pipeline bulkmeters and fuel flowmeters for test rigs and calibration purposes. Quick-release self-sealing couplings are made for aviation fuels and oils, water-methanol, hydrogen peroxide and other liquids.

Aviation Traders (Engineering), Ltd., Municipal Airport, Southend-on-Sea, Essex. (Rochford 56491)

Among the many aviation products of this company are car-loading ramps and passenger steps; engine and powerplant slings, stands and trolleys; specialized forklift equipment and general ground handling and servicing units. Most work done by the company is specialized to customers' requirements; much equipment is exported. The type of work done was originally started to meet the requirements of Air Charter, Ltd., an associated company.

British Insulated Callender's Construction Co., Ltd., 30 Leicester Square, London, W.C.2. (Trafalgar 7777)

This company provides and erects radar and radio masts and towers and is concerned with the installation of airfield lighting and electric supply systems in general. Callender-Hamilton aircraft hangars are also supplied and erected.

Brown Brothers (Aircraft), Ltd., Great Eastern Street, London, E.C.2. (Bishopsgate 7654) and (works) Bedford Road, Northampton. (Northampton 4940)

B.B.A. produced the first gang-powered jacking equipment to be approved in the U.K. and this has been ordered by the M.o.S. and Bristol Aircraft. The set consists of two main wing (40-ton) jacks, a (10-ton) nose-jack, an (8-ton) nose-wheel jack and a power unit. All jacks can be operated together or individually by remote control or by hand pumping. The system is suitable for use with any large aircraft.

David Brown Construction Equipment, Ltd., Hanworth Park, Feltham, Middx. (Feltham 2291)

This company has developed a range of aircraft-towing tractors capable of ground handling most types of military and civil aircraft in general use today. Two models are being produced.

Designed specifically for industrial purposes, the David Brown 900 Taskmaster develops a drawbar pull of 3,700 lb. and can tow aircraft weighing up to 45,000 lb. It is powered by either a petrol or Diesel engine of 40 b.h.p. and has six forward and two reverse gears.

The 900 Turbo Taskmaster is basically the standard Taskmaster with the addition of a Brockhouse Turbo Transmitter (hydraulic torque converter). It is intended for towing aircraft of up to 110,000 lb. weight, having a drawbar pull of 5,600 lb. The Turbo Taskmaster can be fitted with Broughton winches for erection work and aircraft recovery, and with other equipment.

Conveyancer Fork Trucks, Ltd., Liverpool Road, Warrington, Lancs. (Warrington 35241)

Designed for varied tasks, Conveyancer fork trucks are used in maintenance and servicing work and for the transporting and handling of air freight. Three basic types are made which can handle loads of 2,000 lb. to 6,000 lb. and stack to a height of 14 ft. (depending on the model and the type of stacking unit fitted). The electric model E6-24 is battery powered, the D4-24 is Diesel powered, and the TC-4, TC-5 and TC-6 can have either Diesel or petrol engines.

Coventry Climax Engines, Ltd., Widdrington Road, Coventry. (Coventry 62607)

Makers of a number of items of airport ground equipment including fork-lift trucks, trailer fire pumps, generating sets and stationary pumps.

Douglas Equipment, Ltd., Kingsditch Lane, Tewkesbury Road, Cheltenham, Glos. (Cheltenham 56361-2)

Manufacturers of towing tractors including the Tugmaster, which is capable of handling the largest civil aircraft.

Edghill, H.W., and Co., Ltd., Odiham Road, Hook, nr. Basingstoke, Hants. (Hook 40-1)

Producers of aircraft servicing and operational equipment. The Mk. I passenger embarkation step produced by the company is hydraulically adjustable between 4 ft. 6 in. and 10 ft. 6 in.

Flight Refuelling, Ltd., Tarrant Rushton Airfield, Blandford, Dorset. (Blandford 501)

Although generally known for their flight refuelling equipment, this company produces certain apparatus for fuelling at airports. This includes pressure-refuelling gear, flow-test apparatus and aircraft units and hose units for ground refuelling. The last named equipment is also made for handling high test peroxide.

The Godfrey Type R-300 cabin-pressure-testing trolley.

Heston Aircraft and Associated Engineers, Ltd., Heston Airport, Hounslow, Middx. (Hayes 3844-52)

Producers of specialized ground equipment for airports and airlines, such as adjustable passenger steps and aircraft repair docks.

Lansing Bagnall, Ltd., Basingstoke, Hants. (Basingstoke 1010)

Aircraft handling equipment, fork-lift and industrial trucks are produced.

Mercury Truck and Tractor Co., Ltd., The Quay, Gloucester. (Gloucester 24451/2)

This company makes Diesel- and petrol-engined tractors and trucks for towing aircraft and for handling baggage, freight and ground equipment, and elevating platform trucks for loading aircraft.

Tractors in production are the Airtug 70P and the Model 45P, which are to be based at Gatwick by B.E.A., and the Model 10F, which will be used for towing apron equip- by the M.T.C.A. A completely new model, the 30P, powered by a Perkins Four/99 Diesel engine is now available for towing heavy ground equipment, such as starter motors and air-conditioning plants. It is the most powerful Diesel-engined tractor of its size now available, having a drawbar pull of 3,000-lb. The Mercury low/high loader has a carrying capacity of 6,000 lb. The load is adjustable from 42 in. to 138 in. from the ground.

A new company, the **Mercury Airfield Equipment, Ltd.,** has been formed recently and operates from the same address. It provides a complete service for the design and supply of a full range of ground equipment from passenger steps to hangar maintenance docks.

Murex Welding Processess, Ltd., Waltham Cross, Herts. (Waltham Cross 3636)

Murex are makers of engine-driven ground power-units which supply electrical current for pre-flight checks, general servicing and the starting of both piston and gas-turbine aero-engines. Electric arc-welding equipment and electrodes are also produced.

Ransomes Sims and Jefferies, Ltd., Orwell Works, Ipswich, Suffolk. (Ipswich 54711)

A range of battery-powered trucks is produced and can be supplied as forklift, platform or tractor types. They are available with the protected electrical circuit officially approved by civil airport authorities. The re-designing of Ransomes fork-lift trucks has resulted in the recently introduced NR series.

Red Devon, Ltd., Seymour Wharf, Totnes, S. Devon. (Totnes 3282)

Aircraft passenger steps and mobile aircraft starting and aircraft ground power units are made by Red Devon. The steps consist of two light-alloy sections on a tubular steel main chassis with welded joints. A hand-operated screw-gear raises and lowers the two sections.

Ample current for servicing and starting piston, turboprop and turbo-jet engines is provided by the starting unit. An electric generator provides 28.5 V. with amperages up to 600, and voltage is constantly controlled by automatic voltage control. For starting the generator is assisted by batteries giving a discharge current of 1,500-1,600 amps.

The ground power unit can supply 450 amps., at 28.5 V continuously and 650 amps.

Airport Equipment Suppliers . . . .

at 28.5 V. for short periods. These outputs are the direct output ratings from the generators and engine, and not of the combined engine and batteries. The batteries provide peak starting current of up to 2,000 amps.

Rellumit (London), Ltd., Chandos House, Palmers Street, London, S.W.1. (Abbey 3304)

Rellumit manufacture aircraft-refuelling equipment, including micro filters, air eliminators, water separators, coarse filters and nitric-acid couplings.

Rollason Aerocessories, Ltd., Croydon Airport, Surrey. (Croydon 7238-9)

An extensive range of quick-release cargo-securing and handling equipment is designed and manufactured by this company. Many types of servicing and testing equipment are also made, including aircraft hot-spray defrosting and cleaning trolleys, sensitive control and pressure-regulating valves.

Skyhi, Ltd., Skyhi Works, Worton Road, Isleworth, Middx. (Hounslow 2211-3)

One of the principal products of this company is a range of hydraulic aircraft jacks with a capacity of 2 to 30 tons, including tripod and quadruped main-wing jacks. Also produced is salvage equipment, inhibitor guns, aircraft skates, hydraulic loaders and Skyflex high-pressure flexible hose units.

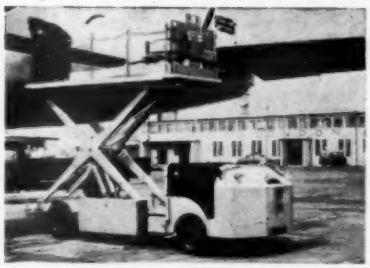
Steel Barrel Co., Ltd., The, Uxbridge, Middx. (Uxbridge 8535)

This company makes mobile aircraft fuellers, tank trailers, pressure-test units and dispenser units for oil and methanol.

Stockport Manufacturing Co. (1950), Ltd., Councillor Lane, Cheadle, Cheshire. (Gatley 4205-6)

Load-clamp and rotating roll-clamp equipment is made by the Stockport Manufacturing Co. for various types of vehicles.

Four types of load clamp are in production, and are available in different forms depending on the type of loads to be moved. The rotating roll clamp has been designed to deal with cylindrical loads up to a maximum weight of 2,000 lb.



A Mercury low/high loader truck in which the load-height can be adjusted between 42 in. and 138 in.

Stream-Line Filters, Ltd., Ingate Place, London, S.W.8. (Macaulay 1011-3)

Filters are manufactured by this company for the removal of solid contaminants and water from aviation fuels. For this a conventional type of filter has been produced which makes use of the principle of edge filtration between paper discs. This, it is claimed, removes the finest solid impurities and has the useful additional characteristic of removing final traces of moisture. A high output filter is now available, and is cheaper and smaller than the above. Also produced are water separators in several types, which can continuously remove all water found in aviation fuels, and control devices which reveal the presence of moisture and enable or initiate appropriate action.

Thompson Bros. (Bilston), Ltd., Bradley Engineering Works, Bilston, Staffs. (Bilston 41264-8)

More than 50 different types of aircraft fuellers have been made by the company during the past 30 years. The latest type to go into production is the 10,000-gal. "Yorkshire" fueller. Designed on the semi-trailer principle, it has a flow capacity of 750 gal./min. and is intended for fast fuelling of jet transports.

Other vehicles now being produced are fuellers of 8,500-gal. capactiy, and 4,000-gal. "bridging" tankers used for bulk transport from the refinery to the airport. In use at many airports all over the World is the Cornwall fueller, which incorporates a unique fuel-delivery system giving a very high pumping performance.

Equipment manufactured by the company includes a by-pass pressure controller designed as a safeguard against excessive pressure during fuelling at any rate of flow, and aircraft fuel dispensers used with mobile tankers and pressure-static pipelines.

Vernons Industries, Ltd., Kirkby Trading Estate, Hornhouse Lane, Kirkby, nr. Liverpool. (Simonswood 3261)

Currently under construction are electric aircraft handlers, claimed to be the first of their kind in operational use, and aircraft starting and servicing units.

The aircraft handler is designed to simplify the problem of manœuvring large aircraft. Operated by one man, the aircraft nosewheel is picked up at the rear end of the handler by means of an electric actuator. The handler uses a pallet arrangement which is attached to the nosewheel and can be adapted for different types of aircraft.

The aircraft starting and servicing units can operate in any specified climatic conditions in any part of the World, and little or no maintenance is needed during normal operation.

Wayne Tank and Pump Co., Ltd., Western Road, Bracknell, Berks. (Bracknell 1600)

The storage, pumping and measuring equipment made by this company is designed to speed-up the refuelling of aircraft. Their products include hydrant refuelling units, fluid meters, the Viking pump unit for viscous fluids, and a high-lift self-priming unit for light distillates.

Zwicky, Ltd., Buckingham Avenue, Trading Estate, Slough, Bucks. (Slough 21201-5)

Various items of airport ground equipment are made by Zwicky. These include mobile airport refuelling units, static airport refuelling systems, oil-tank flushing trolleys, de-icing trolleys, nozzles, hose reels, constant-pressure valves, pumps and filters. At the 1957 S.B.A.C. display the company showed a runway sweeper/collector vehicle.

Electrical Equipment

Airtech, Ltd., Aylesbury and Thame Airport, Haddenham, Bucks. (Haddenham 422-5)

Manufacturers of electronic equipment and mobile installations, the latest of which is the Aircon transportable container. Designed for easy transportation of complete installations of equipment from site to site, it can quickly be put into operation. It is best suited for radio navigational aids and radio-link installations. The basic design of the container is such that it can be enlarged as required, being available either with fixed or detachable end-walls. It is fully insulated and fitted with built-in cable ducts, cable entry panels and ventilation.

Aldis Brothers, Ltd., Sarehole Road, Hall Green, Birmingham, 28. (Springfield 3343)

For many years the name of Aldis has been famous for the long-range signalling lamp, which is used extensively in both civil and Service aviation.

British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2. (Temple Bar 7722)

Manufacturers and suppliers of all types of electrical cables and ancillary equipment for use at airports and in aircraft, including radio-frequency and airfield-lighting cables.

British Thomson-Houston Co., Ltd., The, Rugby. (Rugby 2121)

A wide range of electrical components, plant and accessories is produced by B.T.H. These include engine starters, AC and DC motors and generators, gas-operated turbo-starters, switches and contactors, lighting equipment, silicon rectifiers and reference diodes for operation at high temperatures.

Chloride Batteries, Ltd., Exide Works, Clifton Junction, Swinton, Manchester. (Swinton 2011)

Typical of the uses of Chloride electrical accumulators and batteries are those for which equipment has been supplied to airline operators at London Airport over the past few years. Special Keepalite equipment has been installed to provide emergency lighting systems in maintenance and other buildings; for testing radio equipment; and for an automatic branch telephone exchange. Keepalite equipment with 120 DBNG.5 cells was ordered recently for the B.E.A. Engineering Base at L.A.P. These 120 cells will supply a 10-kW. load for nearly 2½ hr.

Another company in the Chloride Group, **Nife Batteries, Ltd.,** of Redditch, Worcestershire, has supplied 10 stationary batteries and associated control and charging equipment, to Gatwick for emergency lighting and control duties.

General Electric Co., Ltd., The, Magnet House, Kingsway, London, W.C.2. (Temple Bar 8000)

Manufacturers of airport-lighting equipment, G.E.C. has supplied many of the installations at Gatwick.

Three hundred and thirty-one type 2A/201 semi-flush taxi-way lights designed for use on a centre-line installation have been supplied, some for use as stop bar and distance-marker lights. Eighty 2A/401 low-intensity approach lights of new design are installed on the centre line and crossbar approach-lighting system at both ends of the runway. They are fitted with aviation red refractor glasses and house 24-V. 200-W. lamps. Twenty similar units with aviation green refractors are installed as low-intensity threshold lights at the ends of the runway. A 2A/503 airport location beacon housing a 100-V. 2.25-kW. projector lamp has also been supplied by the company. This is used as a hazard beacon and is fitted with four red colour filters and will rotate at 9 r.p.m. giving 36 flashes per min.

Other installations supplied by G.E.C. are for lighting the main concourse, the passenger hall, covered footways, the radar room in the control tower, pedestrian subways, and roadways.

Holophane, Ltd., Elverton Street, London, S.W.1. (Victoria 8062)

Latest product of this company is a new flush-lighting fitting, the LR/22-35. This has been developed from types made for the Air Ministry and is to be installed at Gatwick Airport. It is a non-directional high-intensity fitting for use on principal runways, either as a threshold, centre-line, stub-bar or landing mat. Projection above the ground is ¼ in. and is the minimum consistent with a high light-intensity at a low angular elevation. The light beam is emitted at about 2½° elevation. Photometric performance is 11,000 candela.

Peto and Radford, 137 Victoria Street, London, S.W.1. (Tate Gallery 9212) and (Works) Dagenham Docks, Essex. (Rainham 34)

Manufacturers of accumulators for the ground starting of aero-engines. One of the company's recent developments is a 24-V.

(*Continued on page* 825)

(*Continued from page* 824)

aircraft battery which is used on the Viscount 800 series. The battery is available in two versions. It has a capacity of 25 a.h., and built-in ventilation.

Stone-Chance, Ltd., Gatwick Road, Crawley, Sussex. (Crawley 25251)

Manufacturers of items of airport apparatus, including airport location beacons; automatic emergency generating plant; cover glasses, mirrors, rotary and de-icing switches.

Thermionic Products, Ltd., The Pena Works, Hythe, Southampton, Hampshire. (Hythe 3265)

Manufacturers of multi-channel recording equipment for airport use.

This variety of equipment includes the Mk. I and Mk. II master-record bays; the Mk. VI bay, which provides eight hours' continuous recording on seven channels with playback; and the Mk. VII bay, which can record continuously for 16 hours on up to 14 channels.

Varley Dry Accumulators, Ltd., By-pass Road, Barking, Essex. (Rippleway 3346)

Lightweight high-efficiency batteries for the ground starting of aero-engines are produced.

Winston Electronics, Ltd., Govett Avenue, Shepperton, Middx. (Walton-on-Thames 6321)

Makers of loudspeakers for airport communications and tape recorders. In production is the Tellaloud loudspeaking telephone.

Specialist Equipment

George Angus and Co., Ltd., Angus House, Newcastle upon Tyne. (Newcastle upon Tyne 22656-9)

In the field of fire-fighting equipment George Angus manufactures Thermoflex and Thermofoil protective clothing; Invincible general fire-fighting equipment and Fire Fighter, Fire Chief and Angus rubber hose.

Bell's Asbestos and Engineering, Ltd., Bestobell Works, Slough, Bucks. (Slough 25151)

Bell produces many items for use in aviation, and those notably concerned with airports are concertina hoses for air-conditioning trucks; pressurizing hoses for cabin-test trolleys; asbestos clothing for fire-fighting and maintenance work.

Fire Armour, Ltd., 9 George Street, Baker Street, London, W.1 (Welbeck 3313, 2678 and 8981), and (Works) G.W.R. Sidings, Wood Lane, London, W.12.

Producers of all types of fire-fighting and rescue equipment, including aircraft crash tenders, rescue vehicles, pumps and ancillary gear. The company is the sole manufacturer of Fognozl equipment in the U.K.

Sir George Godfrey and Partners, Ltd., Florian House, George Street, Croydon, Surrey. (Croydon 2273)

Makers of all types of fire-fighting equipment and protective clothing.

Sir George Godfrey and Partners, Ltd., Hampton Road West, Hanworth, Middx. (Feltham 3291-7 and 4661-2)

Equipment now in production includes air-conditioning and pressure-testing trolleys (R-2000 Mks. 2 and 3) and the R-300 pressure-testing trolley. The former is a towable four-wheeled unit for cooling, heating and pressure-testing aircraft, with provision for introducing deodorants or fumigants into the airstream. Power for the blower is provided by a Rolls-Royce B.81 Mk. 50G engine using unleaded fuel. Pressures up to 12 p.s.i.(g) and flows up to 1,860 cu. ft./min. are available, with a temperature drop of 90° F.

For the 9-cwt. three-wheeled testing trolley, pressure is obtained from a Godfrey K-300 Style 31 Roots-type blower driven by a Coventry-Victor AC-4 air-cooled engine. Manually operated spill and bleed valves control the air supply through a 4-in.-bore hose in four 10-ft. lengths. Maximum pressure is 10 p.s.i.(g) and the airflow rate is 225 cu. ft./min.

Walter Kidde Co., Ltd., The, Lux Works, Belvue Road, Northolt, Middx. (Waxlow 1061)

Concerned with the manufacture of wheeled and fixed carbon-dioxide fire-extinguisher systems.

Merryweather and Sons, Ltd., Greenwich High Road, London, S.E.10. (Tideway 1016)

This company's interest in airport equipment lies in appliances designed for fire protection. In production are two types of foam tenders and a water tanker.

The Type A foam tender is built on a four-wheel-drive chassis powered by a 115-b.h.p. six-cylinder petrol engine. It carries 400 gal. of water and foam compound, carbon dioxide cylinders, a 22-ft. two-section light-alloy extension ladder and lighting equipment. The cab seats two. The Type B appliance is similiar, but the cab seats six. Both tenders are capable of producing 2,000 gal. of foam per minute.

The water tanker is a complementary vehicle to the foam tenders and is based on the same model chassis. It carries 600 gal. of water to serve as a reserve water supply for the foam tenders. The water tanker also carries a rear-mounted fire pump and foam compound, so that it can be used as a stand-by foam-generating appliance.

New Welbeck, Ltd., Moulsecoomb Way, Brighton 7, Sussex. (Brighton 61666)

Industrial and commercial suction cleaners which have been designed by New Welbeck for the quick cleaning of all means of public transport, factory floors, plant installations, and so on.

Nu-Swift, Ltd., Elland, Yorks. (Elland 2852)

Manufacturers of the range of Nu-Swift fire extinguishers.

S. Parsons and Co., Ltd., Young Street, Bradford, Yorks. (Bradford 45494)

Specialist designers and manufacturers of aircraft-weighing equipment, general airport weighing equipment (luggage, etc.), and engine thrust-measuring gear.

Pyrene Co., Ltd., The, Great West Road, Brentford, Middx. (Ealing 3444)

Fire-protection systems and equipment for aircraft and aerodromes are the particular concern of Pyrene; smoke and fire detectors, and general fire-extinguishing apparatus and installations are produced.

Airfield crash tenders and trailers are also made, one of the latest types being the Pyrene Mk. VI heavy-duty model. Powered by a 238-b.h.p. Rolls-Royce engine, it is designed for fast travel over rough ground and can project foam at the rate of 10,300 gal. in 2 min.

R.F.D. Co., Ltd., Godalming, Surrey. (Godalming 1441-5)

Concerned with the manufacture and development of lifting bags, aircraft weather covers and wind socks.

Fuels and Oils

British Petroleum Co., Ltd., The, Britannic House, Finsbury Circus, London, E.C.2. (National 1200)

This company distributes B.P. aviation products through its marketing subsidiary, B.P. Trading, Ltd., and through overseas associated and subsidiary companies under the trading style of B.P. Aviation Services.

Esso Petroleum Co., Ltd., Aviation Dept., 101-4 Piccadilly, London, W.1. (Grosvenor 4251)

Modern facilities are provided by Esso's fuelling centre at Gatwick and a 24-hr. service will be operated by a staff of 19 crewmen. The installation consists of 12 storage tanks containing three grades of aviation petroleum (100/130, 108/135 and 115/145), and aviation turbine fuel. Aviation oils and specialist aviation products are also provided.

Initially, service will be provided by two 4,000-gal. Pluto refuellers equipped with twin compartments and twin hoses. Each can deliver 200 gal./min. from each hose at an underwing refuelling pressure of 50 p.s.i. A 400-gal. Karrier Bantam unit will be available to dispense both aviation oil and water-methanol.

One of the 4,000-gal. Pluto refuellers (Steel Barrel Co.) which will be used by Esso Petroleum at Gatwick

Shell-Mex and B.P., Ltd., Shell-Mex House, Strand, London, W.C.2. (Temple Bar 1234)

One of the main distributors of aviation petroleum products, Shell-Mex and B.P. operate fuelling services on many of the major airports in Great Britain. The latest equipment is provided at the aircraft fuelling centre at Gatwick Airport.

Aviation turbine fuel and three grades of aviation petroleum (100/130, 108/135 and 115/145) are stored in 10 12,000-gal. tanks underground. Four remotely controlled electric centrifugal pumps will fill the aircraft fuelling vehicles at 250 gal./min. Bottom loading is employed with an automatic cut-off. Pre-set meters are installed in the delivery lines and the hoses are fitted with self-sealing couplings.

Five delivery vehicles will be based at the centre. Three Cornwall fuellers of 3,200-gal. capacity each with a 2,500-gal. trailer, and two vehicles of 1,200- to 1,500-gal. capacity. Provision is being made for dispensing aviation lubricants and water-methanol.

Wakefield, C. C., and Co., Ltd., 46 Grosvenor Street, London, W.1. (Mayfair 9232)

One of the petroleum companies which specializes in aero-lubricants, C. C. Wakefield produces Castrol and Castrolaero oils and greases, and Wakefield mechanical lubricators.

Airport Construction

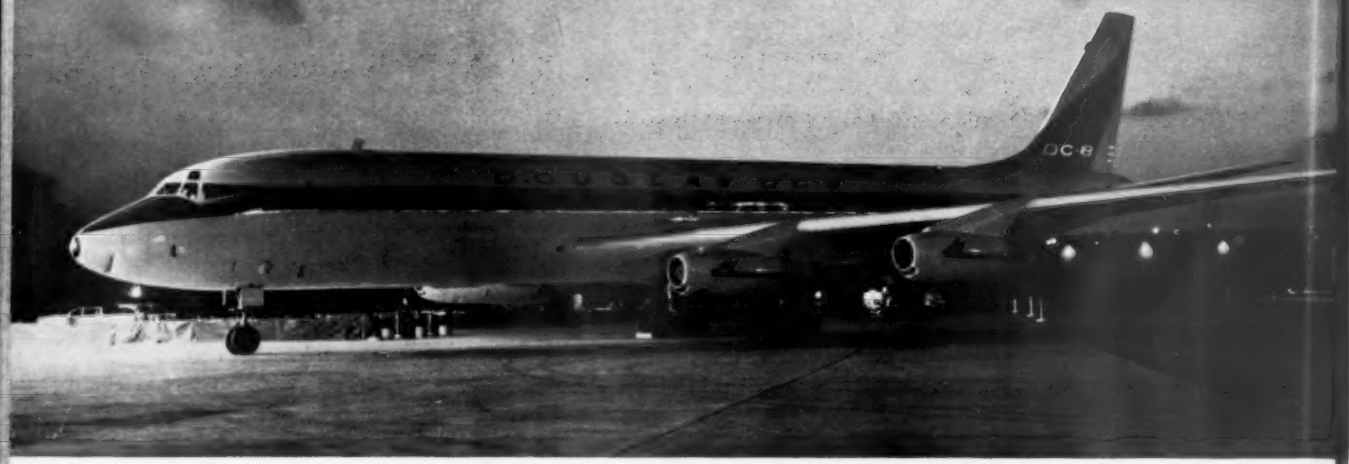
Bellman Hangars, Ltd., Terminal House, Grosvenor Gardens, London, S.W.1 (Sloane 5259) and (Works) Whittlesford, Cambs.

Richard Costain, Ltd., 111 Westminster Bridge Road, London, S.E.1. (Waterloo 4977)

John Laing and Son, Ltd., Page Street, London, N.W.7. (Mill Hill 3636)

George Wimpey and Co., Ltd., Hammersmith Grove, London, W.6. (Riverside 2000)

Great Day for the DC-8



An eye-witness account of the Douglas DC-8's first flight, by F. G. SWANBOROUGH *of the staff of* THE AEROPLANE, *and some new information on the development of this important aircraft.*

MAY 30, which is celebrated in the U.S.A. as Memorial Day, will in future be celebrated by Douglas Aircraft Co. as DC-8 Day—the day on which that turbojet transport made its first flight. As a visible sign of faith in their new product, the company had announced the day and hour of the first flight earlier in the week and had extended an invitation to all their employees to visit the Long Beach factory in California, where the take-off was to be made.

The only thing which seemed likely to upset the plan was the weather; for all California's much-vaunted sunshine, the Los Angeles area is particularly prone to a vicious, eye-stinging smog during the summer months—and the C.A.A. had decreed that the DC-8 could fly only if there were five miles' visibility and no tail-wind component down the N.E.-S.W. runway which had to be used.

Fortunately, since 50,000 or more folk turned out to see the DC-8 depart, these conditions were achieved, and the take-off was made 10 minutes after the announced target—at 10.10 hrs. At the controls was A. G. Heimerdinger, flight operations manager of the Santa Monica Division, together with W. M. Magruder as co-pilot, P. H. Patten as systems engineer and a flight-test observer. The flight crew had been busy taxi-ing the DC-8 for a week or more and had also completed 35 hours' "flight" in the Link electronic flight simulator, during which they each operated from all the three flight-crew positions.

The first flight test-pilot team was headed by A. G. Heimerdinger (centre), flight operations manager for the Douglas Santa Monica Division. He was assisted by William M. Magruder (left) as co-pilot and Paul H. Patten as systems operator.

This is, we believe, the first time in which a simulator has been available before the aircraft itself has flown—but there are many "firsts" about the DC-8. We doubt whether so many people have ever watched the first flight of a brand-new aircraft before, and certainly we can recall no other aircraft comparable in size and complexity which has gone so rapidly straight from design to production. The actual decision to proceed with construction of the DC-8 was taken in June, 1955, and the first aircraft was rolled out of the Long Beach assembly plant just a year and a day after that plant had been formally dedicated. The whole programme has, in fact, been on a "crash" basis, with April 20 as the target date for the first flight.

Of the take-off itself, there is not a great deal to be said. The pilot had told us previously that he would unstick at 130 knots after a ground roll of about 3,500 ft., at a weight of 197,000 lb., and this programme was achieved. Included in the take-off weight was some 6,000 lb. of water for the engines—burnt off in the first minute or so—and contributing, no doubt, to the four streamers of black smoke which the DC-8 trailed, sadly spoiling the effect of the all-white aircraft against a clear blue backdrop. The noise level, heard from the edge of the runway about 4,000 ft. from starting point, seemed to us to be very reasonable, although the "daisy" suppressors on this aircraft are only temporary.

The third and subsequent aircraft, regardless of powerplant type, will have Douglas suppressor/reverser attachments of a new design. In these, a complete segment of the nacelle or pod moves aft for take-off and landing to form an annular intake around the "daisy." This, it is claimed, by inducing a little more air to mix with the exhaust gases, reclaims the thrust loss from the suppressor—although Douglas have not yet given detailed figures. The sliding portion of the pod also contains both the clam-shell halves which form the reverser, or thrust-brake, diverting the exhaust through the sides of the segment.

There are a few other non-standard items on the first DC-8, including emergency crew escape provision and speed brakes on each side of the fuselage to the rear of the wing fillet. These will be replaced by the thrust brake in due course. The spoilers, designed to destroy lift during the landing run, can

be operated only when the nose-wheel leg is compressed.

Production of the DC-8 is mounting steadily at Long Beach, where the second complete airframe is now undergoing static testing and the third is in final assembly—and will be the next to fly. This latter aircraft will be one of the United Air Lines' fleet, the first being a Douglas-owned aircraft to U.A.L. specification. Number 2, the static test specimen, will in due course be the first to fly with JT-4s for P.A.A.; the first DC-8 for export, now in major assembly, will be No. 9—the first with Conways for T.C.A. Nine aircraft—four with JT-3C-6s, three with JT-4A-3s and two with Conway 507s—will eventually be used in the C.A.A. type certification programme, which is aimed at obtaining approval, respectively, in October, 1959, November, 1959, and February, 1960, and will require over 1,500 hours of flying.

Meanwhile, the fatigue water-tank test is well advanced, with just short of 120,000 cycles completed to date. Each sequence covers a take-off, climb and pressurization, introduction of a high gust load, depressurization and landing, with simulation of passenger loads on the floor beams and so on. The actual pressure, at about 9.5 p.s.i., is a little above the normal working pressure of 8.77 p.s.i. The test to date is reported to be most satisfactory, with a few small modifications made in the production aircraft in the light of the results. The test is now continuing indefinitely to prove the fail-safe characteristics of the DC-8—i.e., that the only result of a crack or failure will be loss of pressure.

To the four basic versions of the DC-8, all structurally similar and externally identical, have now been added two more. The existing variants, all on order, were domestic (U.S.) aeroplanes with a gross weight of 265,000 lb. and JT-3 or JT-4 engines, and international aeroplanes with a weight of 287,500 lb. and JT-4 or Conway engines. There are now longer-range variants of the international DC-8, with either type of engine, grossing 310,000 lb. Fuel tanks, with a capacity of 260 Imp. gallons, replace the water tanks at the wing tips and there is an additional 1,130 Imp. gallons of fuel in new tanks in the wing fillets. The new gross weight also anticipates increases in the power of the JT-4 and Conway, from the 17,000 lb. or so, on which the 287,500-lb. aeroplane is based, to not less, probably, than 18,500 lb.s.t. each.

P.A.A. are likely to take some of their 17 DC-8s at the new weight as the extra range will be useful on the critical Seattle-Tokyo sector. Alitalia-L.A.I. also specified this model in their recent order for four, and some of the other European operators are interested.

Right, this picture of the flight deck of the DC-8 was taken during vibration tests—hence the strange appearance of the control half-wheels. The relative simplicity of the layout is noteworthy.

Below is a picture of the DC-8 taken over Southern California during its first flight. The double-slotted flaps seem to be fully extended during the comparatively slow-speed formation flying necessary for this photograph to be taken.

THE FIGHTING SERVICES

Senior Postings

AIR VICE-MARSHAL S. O. BUFTON, C.B., D.F.C., is to become Assistant Chief of the Air Staff (Intelligence) in succession to Air Vice-Marshal W. M. L. MacDonald, C.B., C.B.E., D.F.C. Taking up his new appointment in August, A.V.M. Bufton has been Senior Air Staff Officer at Headquarters, Bomber Command, since October, 1955, and for the two previous years was Air Officer Commanding, British Forces, Aden.

Air Commodore J. G. Davis, C.B., C.B.E., who has been Director of Plans at the Air Ministry since August, 1955, is to succeed A.V.M. Bufton at Bomber Command this month, with the acting rank of Air Vice-Marshal. Since 1951 Air Cdre. Davis has served at Headquarters, M.E.A.F., and commanded R.A.F. Topcliffe.

Air Commodore C. S. Moore, O.B.E., is to become Air Officer in Charge of Administration, M.E.A.F., in July. Director of Intelligence at the Air Ministry since August, 1955, Air Cdre. Moore went to the United States in 1949 for four years, under the exchange posting scheme, for special duties in Washington and as R.A.F. representative at the U.S.A.F. Air University at Alabama. In 1953 he was appointed Air Officer Commanding, No. 66 (Scottish) Group, Home Command.

R.A.F. Benevolent Fund Progress

PUBLISHED last week, the 1957 Report of the R.A.F. Benevolent Fund states that the Fund last year assisted 4,905 applicants for the first time, bringing the number of helped applicants on its books to 189,227, and the number of grants and loans made since it was founded in October, 1919, to 400,332.

Since the Fund was established a total of £8,137,900 has been disbursed on all forms of assistance. Between VJ-Day in 1945 and December 31, 1957, the number of awards made was 304,448. Compared with 1956, expenditure last year was higher on business loans and grants; clothing, boots and bedding, and debts—all reflecting, directly or indirectly, the increase in the overall cost of living and monetary conditions generally. Expenditure on education showed little variation from the record figure of 1956—a reduction of £648 to £214,069.

During the past 11 years the Fund has spent £1,572,885 on education. The Fund now has 146 honorary education advisers on its panel, all having special qualifications and knowledge enabling them to formulate plans for the education of those children for whom the Fund accepts some financial responsibility.

TRIPLE VICTORS.—Air Marshal Sir Bryan Reynolds, A.O.C.-in-C., Coastal Command, presenting the Dunning Memorial Cup to Wg. Cdr. J. R. Graham, O.C., No. 228 Squadron, at R.A.F. St. Eval. No. 228 Squadron has recently won this award for proficiency in anti-submarine warfare, the Aird Whyte Swimming Trophy, and the Coastal Command Photographic Cup for air photography.

NAVAL EXERCISES.—The Minister of Defence, Mr. Duncan Sandys, being lowered from a Westland Whirlwind on to the deck of a fri ate during his visit to Portland last week to see submarine exercises. He later returned to London by helicopter.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Group Captains: M. C. R. White to No. 25 M.U. to command; R. F. Aitken, O.B.E., A.F.C., to the R.A.F. Staff College, Andover, as Assistant Commandant; C. B. E. Burt-Andrews to R.A.F. Bridgnorth to command; R. M. B. D. Duke-Woolley, D.S.O., D.F.C., to Headquarters, Fighter Command, for air staff duties; I. G. Esplin, O.B.E., D.F.C., to R.A.F. Wartling to command.

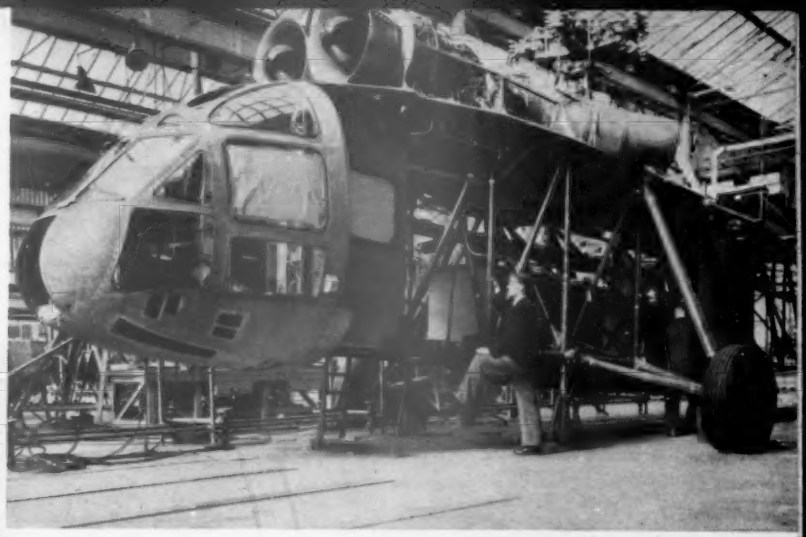
Wing Commanders: H. D. P. Bisley, O.B.E., A.F.C., to Air Ministry for duty in the Department of the C.A.S. (with acting rank of Gp. Capt.); A. E. Arnott, O.B.E., to R.A.F. College, Cranwell, for administrative duties; D. R. Biggs, D.F.C., to Headquarters, Home Command, as Deputy Inspector of Recruiting; A. G. Cadman to Headquarters, F.E.A.F., for administrative staff duties; C. R. Iliffe to No. 28 M.U. to command; D. McD. Jannaway, O.B.E., to Air Ministry for duty in the Department of the Air Member for Supply and Organization; E. V. Masters, M.B.E., to Officers' Administrative Training School to instruct; W. G. Meacham to A.A.F.C.E., for staff duties; G. M. Beer to Headquarters, 2nd T.A.F., for administrative staff duties; L. R. Flower, M.B.E., M.M., to the Air Ministry for duty in the Department of the Air Member for Supply and Organization; J. C. Hunter to R.A.F. Shawbury to command No. 27 M.U.; T. W. James to No. 94 Maintenance Group to command; A. S. Mohan to Headquarters, No. 12 (Fighter) Group, for technical staff duties; H. G. A. Scilley to the Air Ministry for duty in the Department of the Air Member for Supply and Organization; E. D. Smith to the Radio Introduction Unit to command; A. W. G. Stuart to R.A.F. Burtonwood for administrative duties.

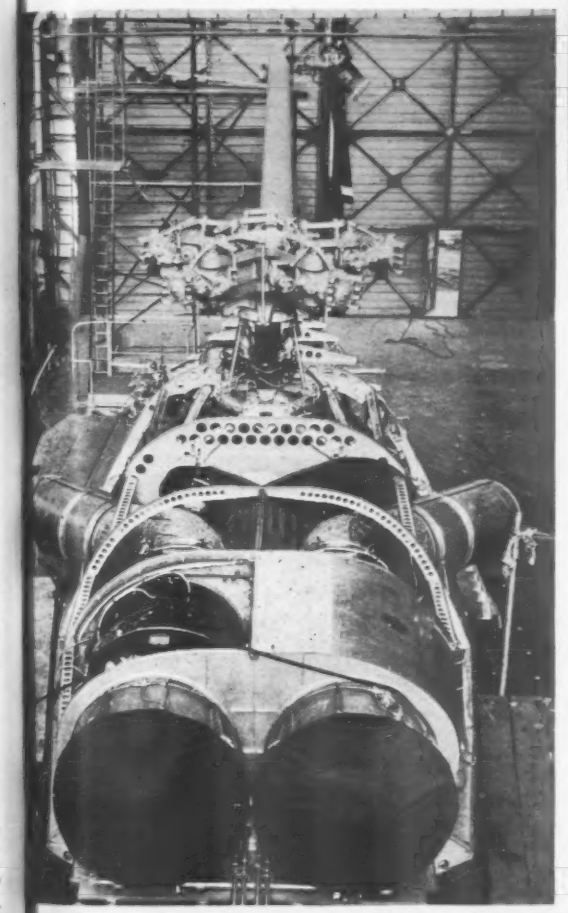
Wing Officer B. G. Martin, W.R.A.F., to Headquarters, M.E.A.F., for administrative staff duties.

Squadron Leader K. R. Bowhill, O.B.E., to R.A.F. Church Fenton to command the Administrative Wing (with acting rank of Wg. Cdr.).

Squadron Officer B. C. Turier, W.R.A.F., to Headquarters, Bomber Command, for administrative staff duties (with acting rank of Wg. Off.).

New at Yeovil



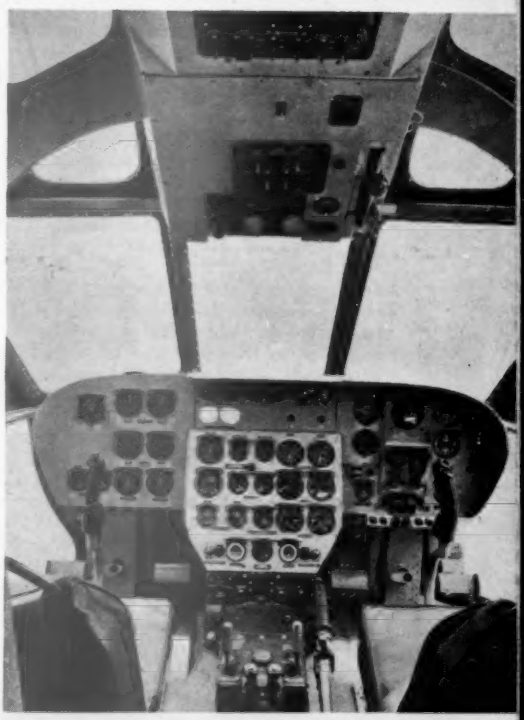


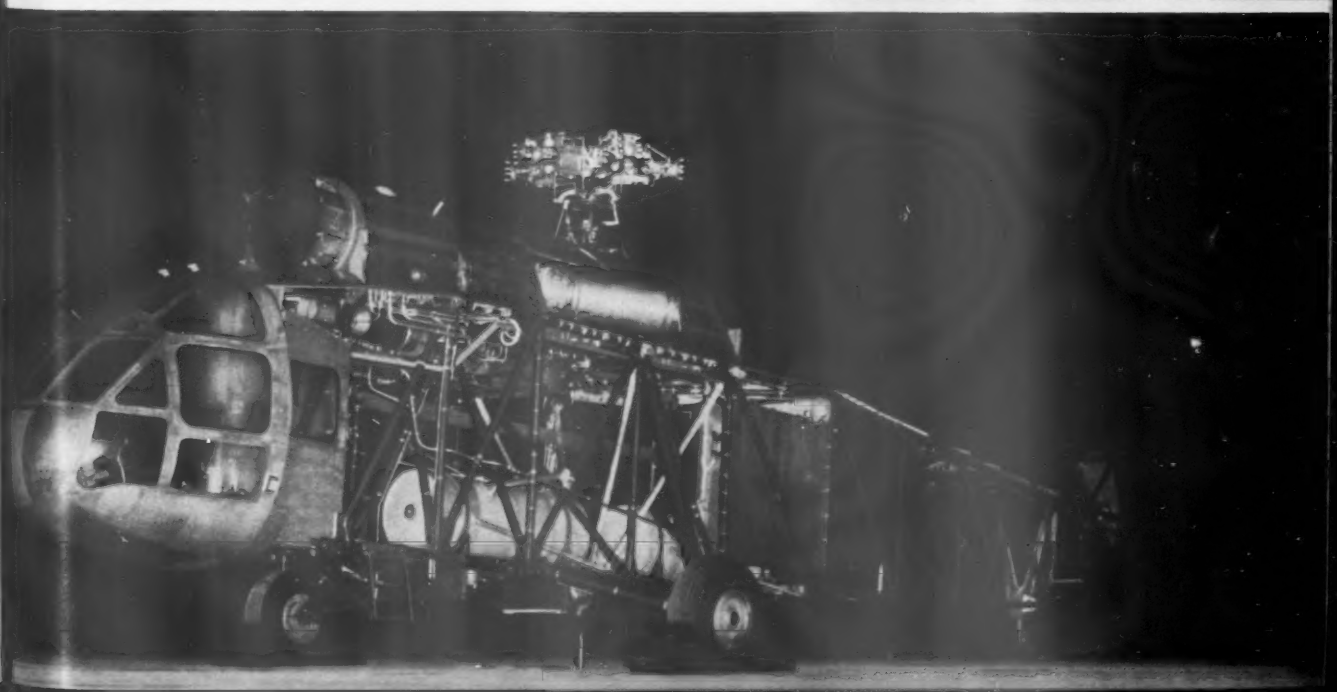
Above, the Westland Westminster prototype in its utility ("crane") version being prepared at Yeovil for initial engine runs.

Left, this view gives a good idea of the layout of the Napier Elands in relation to the shaft-driven rotor hub.

Right, as befits a large twin-engined helicopter, the Westminster has a comprehensive, but tidy, array of cockpit instruments.

Below, engine runs started on June 3 and were done with the rotor-drive clutch disengaged and without the rotor blades installed. The large panel on the port side of the open-girder fuselage is for test instruments.





BOOK REVIEWS

THE SOURCES OF INVENTION. By John Jewkes, David Sawers and Richard Stillerman. 428 pp. 8¼ by 5. Macmillan and Co., Ltd. Price 31s. 6d.

"HISTORY is not simple and cannot be made to seem to be so without distortion of facts."

This sentence in an informing and mildly disabusing book explains one reason for its interest. The main text and the case histories which form a smaller second section in the study lead the reader to some understanding of the human realities in inventive processes. For instance, one of the very few inventions for which direct credits can be given is that of the zip fastener. One man invented the system (his first patent application was filed in 1891) and another made the device work as a piece of practical production equipment; but even the efforts of these two men might not have been enough if two major manufacturers had not applied the new quick-fastening system to items of clothing which were in mass-production in 1918 (flying suits) and 1923 (galoshes).

For the majority of inventions it can be said that the finally successful leap usually followed a series of short hops by often largely unknown enthusiasts, and that some of the best-known inventions were developed almost simultaneously in several countries. Radar, for instance, was devised in at least five countries and the turbojet engine in two countries (the U.K. and Germany). These facts do not in the least reduce the stature of Sir Robert Watson-Watt, who forced radar development through in the U.K., or of Sir Frank Whittle, who worked and fought for the jet engine in an atmosphere of extraordinary official indifference. All the same, it is a little humbling to be reminded of the fact that the French liner "Normandie" was fitted in 1935 with an "obstacle detector" which worked on decimetric waves and employed magnetrons and the pulse principle.

But the greater part of the effort which has gone into this book is concerned with the study of inventive effort and its success or otherwise in relation to the environment in which this effort is expended. Prof. Jewkes and his co-authors reach the conclusion that the financial help and backing of big industrial organizations do not necessarily produce the best results—and that a powerful organization can be as stultifying as it may be helpful. The authors suggest, too, that, as large individual fortunes tend to disappear with progressively increasing taxation, a major prop for the inventor will disappear with them. This support—which is now found almost solely in the United States—can never be replaced adequately by public or private institutions.

If the arguments are to be followed and understood the book must be read. The best I can do is to take one quotation out of context and to suggest that this may offer a hint to those who propose to employ salaried inventors: "... there is much truth in the belief that 'the only thing men of power can do for men of genius is to leave them alone'."—H.A.T.

HEAD IN THE CLOUDS. By Muriel Hanning-Lee. 191 pp., 8 in. by 5¼ in. Hodder and Stoughton, Ltd. Price 12s. 6d.

TO ONE who is accustomed to thinking of air travel in terms of the big highly organized airlines this book comes as an eye-opener, for it describes the hand-to-mouth existence of an air hostess employed by one of the lesser air transport companies. During a period of nearly 10 years Miss Hanning-Lee—a Canadian—worked for several British firms, most of the time for a charter company which was so small that each member of the staff was acutely aware of its financial situation. On one occasion, for instance, when a charter involved quite a lot of dead mileage, the captain had to enforce drastic economies, and Miss Hanning-Lee spent a miserable night in a waiting-room chair at Bahrein, thinking longingly of the air-conditioned B.O.A.C. rest-house, in order to save her company the cost of a room.

She does not set out either to debunk or to glamorize the rôle of air hostess, but I cannot help feeling that the title "air hostess"—conjuring up, as it does, a picture of somewhat stereotyped efficiency and charm—hardly does justice to our heroine. The emergencies she had to deal with from time to time ranged from an attempted suicide to an escaped snake, but her duties were as varied as her adventures. At one time her normal day included *all* the secretarial work at her firm's London office (this meant coping with visas, Customs, declarations, passenger lists and much else), as well as the catering (sometimes she cut the sandwiches herself), and from this she went straight on to do the actual "hostessing" duties on the flight.

She evidently found the life very stimulating, and when at one point she did contemplate taking a "regular job," she refers to it as a "dreaded step." The contact with people was one of the main attractions for her, whether they were film stars, or ships' crews, or even Moslem pilgrims who wanted to light Primus stoves during the flight. At the time of the Berlin air-lift she wrote to a friend: "If only we were dealing with *people* instead of *things*." Incidentally, parties of students are, so it seems, the ideal travellers from the viewpoint of a charter company: they delight in roughing it.

This is an interesting book, but the author reveals little of her own personality. One gets glimpses of her off duty, sight-seeing and night-clubbing at the various ports of call, but she does not mention the names of the crew-members with whom she worked so closely, and this makes her account seem strangely impersonal. She does, however, succeed in avoiding the flavour of a career-book for girls.

Miss Hanning-Lee was killed in an air crash in November, 1957, and the publishers have included in her book a tribute by one of her colleagues. He tells a delightful anecdote about her: on one flight there was a gentleman who had underestimated the effect of drinks at altitude. Suddenly he said to her, "I suppose you think I am drunk." In a flash she replied, "Oh, I hope so, sir; I should hate to think there is any other reason."—C.B.S.

JET PLANES WORK LIKE THIS. By John W. R. Taylor. 63 pp., 6 in. by 9¼ in. Illustrated. Phœnix House, Ltd. (London), and Roy Publishers (New York). Price 9s. 6d.

THIS BOOK, as its dust cover says, is "for young people." It is one of a series which also covers television, atomics, radar, transistors and helicopters. Judging by this one the series is aimed at schoolboys in their 'teens.

Its length does not allow matters to be surveyed in great detail, and it ranges widely over jet development since the days of Hero. It surveys pioneer turbojet work in Britain and Germany, wartime jet aircraft and post-War developments in the turbojet, turboprop, ramjet and rocket fields. Principles of the jet engine are explained and differences between the basic types are made clear. A chapter describes the shape of new aircraft which depend on jet power and other chapters look into the future of jet propulsion and its influence on space travel.

The writing throughout is simple and clear, although the author does not fall into the trap of writing down to his readers.

Only rarely can any of his explanations be faulted. One with shortcomings refers to the ramjet; the explanation of how this works is somewhat misleading and the diagram shown certainly does not represent conditions in a supersonic ramjet, as the text implies.

The treatment of boundary-layer control is also a little confusing; no distinction is made between its applications for increasing lift and those for decreasing drag. In the second case suction is applied to maintain a laminar boundary layer. This does not increase the lift, as stated, but in fact reduces drag.

The book is rather expensive, considering that it has only 63 pages and is printed on thick, rough-surfaced paper. It is profusely illustrated, with line drawings on almost every page. These are very well done, but detailed drawings do not show up clearly because of the paper used. The worst offender in this respect is a cutaway drawing of the Orenda engine. Most of the drawings and diagrams, however, have obviously been produced with the limitations of the paper in mind and are clear, straightforward and effective.

The shortcomings of this book are few and minor when it is viewed as a whole; schoolboys will read it avidly and with pleasure.—J.R.C.

NEWS OF INDUSTRY

A Fuel-flow Test-house

A NEW fuel-flow test-house at Treforest, Glamorgan, was opened on June 6 by the Minister of Supply, the Rt. Hon. Aubrey Jones. It has been installed by Firth Cleveland Instruments, Ltd., a recently-formed subsidiary of Simmonds Aerocessories, Ltd., and will be used for testing the products of both companies, whose factory is at Treforest.

Firth Cleveland Instruments, Ltd., is a M.o.S. design-approved company for aircraft flowmeters and tank gauges. Its equipment is installed in several military aircraft such as the Sea Vixen fighter and the Scimitar and N.A.39 naval strike aircraft. Other applications are in the flight-refuelling equipment for V-bombers.

Fuel-flow tests can at present be made in the test-house with hydro-carbon fuels such as Avtur, Avgas, Avtag and pool gas oil. The facilities may be extended in future to cater for the exotic aircraft fuels and rocket propellents.

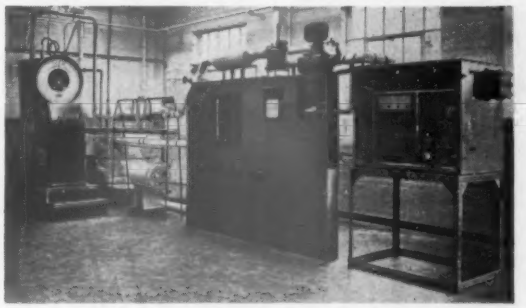
Fuel is supplied to the test-house from four 3,000-gal. tanks sunk in an enclosed concrete wall. There are three lines for flowmeter and instrument test work and fuel can be pumped through each of these at rates up to 8,000 g.p.h. There is a fourth test line for industrial water separators, filters, valves and mechanical equipment; flow rate through this line can be up to 60,000 g.p.h. Test rigs can be paralleled to provide higher flow rates.

The test-house is in three sections. There is a control room with remote-control consoles for each test rig, a laboratory with flowmeter and instrument test rigs, and a second laboratory with equipment for testing water separators, filters, strainers, valves and other mechanical-control equipment.

After passing through the water-separator test rigs the fuel is returned to the storage tanks. The flowmeter test rigs each have a local reservoir and pump and are self-contained. For test purposes the fuel passes into a weighing tank and returns to its storage tank after a test is completed.

Dekatron units measure the filling time of the weighing tanks and the flowmeter-transmitter frequencies. Timing pulses for these Dekatron units are provided by pulse generators. Mass flow is measured by Avery weighing machines with contacts for operating timing devices. In this way the flow rate and total mass flow can be measured to within 0.2%.

Aircraft flight conditions can be represented on the flowmeter rig; the flow rates of present-day and future aircraft can be reproduced accurately. For development tests fuel can be heated or cooled within the range of −40° to +55° C. and an automatic programming unit enables varying flight conditions to be simulated.



This test rig in the Firth Cleveland fuel-flow test-house at Treforest is used for development tests on aircraft flowmeters.

Missile Auxiliary Power

SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT, LTD., has released details of its TP-1 gas generator which burns iso-propyl nitrate to provide auxiliary power for guided missiles. This gas generator has been proved in tests with the Seaslug surface-to-air missile.

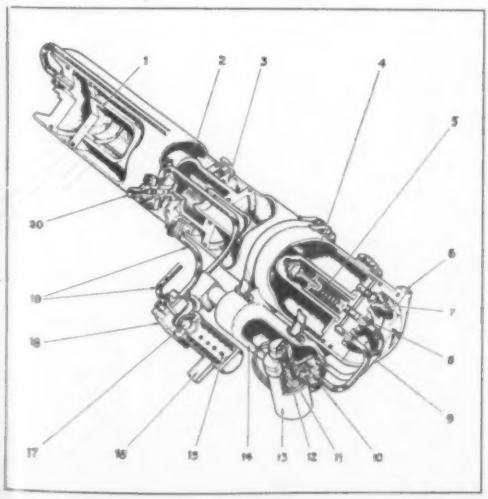
Iso-propyl nitrate is a safe mono-propellent fuel, insensitive to shock and incapable of detonation, which can maintain combustion under pressure in the absence of air. Storage regulations for it are the same as those for petrol, and it is easy to handle provided the usual inflammable-liquid precautions are observed. There are many advantages, it is claimed, in using this fuel to provide missile auxiliary power.

Conventional methods by providing auxiliary power for missiles are by the use of solid-fuel generators, inert gas stored at high pressure, ram-air or other liquid-fuel gas generators. Their drawbacks are respectively that with solid fuel the gas-production rate cannot be varied at will; that high-pressure gas involves long-term storage problems and bulky cylindrical or spherical storage bottles, and that ram-air systems are limited to operation in the lower atmosphere. None of these drawbacks apply to iso-propyl nitrate and it has advantages over the other liquid fuels used for gas generation.

With iso-propyl nitrate the fuel can be burnt at varying rates depending on the power needed and not continually at the rate to meet maximum-power demand. As a result the gas generator can be light and compact. The burning rate of solid fuel varies according to the surrounding temperature but iso-propyl nitrate is not affected in this way. A further advantage is that it can be stored in fully-loaded gas generators for two years without the need for maintenance or topping up.

The Armstrong-Whitworth TP-1 generator delivers gas at 400°C. and 625 p.s.i. On entering its stainless-steel combustion chamber the iso-propyl nitrate is ignited by a cordite charge and burns at 1,200° C. A mixture of water and methyl alcohol is injected to cool the hot gas stream, most of which goes to provide auxiliary power. The remainder of the gas is tapped off to drive pistons which expel the fuel and coolant so that the system is self-sustaining. The fuel control-valve is operated by gas tapped from the combustion chamber.

The system attains its normal working pressure in less than half a second after the igniter charge is fired. Its running time depends upon the gas demand.



Details of the Armstrong-Whitworth TP-1 gas generator:—1, Coupled piston assembly; 2, coolant; 3, fixed centre ring; 4, fuel; 5, control-valve spring; 6, mounting lug; 7, fuel-isolating-valve; 8, fuel-control-valve; 9, control-valve gas supply; 10, fuel atomizer; 11, electrical igniter; 12, auxiliary charge; 13, breech; 14, combustion chamber; 15, filter; 16, gas supply-line; 17, shear disc; 18, coolant chamber; 19, gas feed lines to pistons; and 20, coolant isolating-valve.

I.C.I. Titanium Price Reductions

A REDUCTION in the price of wrought titanium and titanium-alloy products was announced by the Metals Division of Imperial Chemical Industries, Ltd., on June 4. This reduction, which is effective for material delivered after July 1, ranges between 5 and 20% depending on the product concerned.

Before these reductions the cost of wrought titanium sheet was about £6 a pound and titanium rod about £5 a pound. The reductions are in line with the I.C.I. policy of reducing titanium prices as rapidly as possible.

Until recently titanium production was geared almost entirely to the demands of the aircraft industry. Aeronautical demand led to an I.C.I. decision late in 1955 to build a new plant for titanium sheet and rod production. This plant was set up at Waunarlwydd, near Swansea, and came into service recently.

As a consequence of the 1957 Defence White Paper the aircraft industry's demand for titanium has not grown as expected; it is in fact only a quarter of that predicted on the demand trend of 1956-7. As a result the Waunarlwydd plant is operating at considerably less than 50% of its capacity, which is 1,500 tons of bar and up to 300 tons of sheet (depending on type) a year.

New outlets for titanium are being found, particularly in the chemical industry, but some 85% of output is still absorbed by the aircraft industry. Among aircraft embodying titanium are the Vulcan and Victor, P.1, Sea Vixen, Scimitar, Comet and Britannia (which has some 1,800 lb. of titanium in its airframe).

Typical uses are for firewalls, bulkheads, bolts, engine rings and compressor blades. In future titanium will probably be applied increasingly to undercarriages and used in the form of drawn tubing for hydraulic systems.

PRIVATE FLYING

H.J.C.'s Club Commentary:

● A CORRESPONDENT sends us the following story about Central African flying; it is a good example of how enthusiasm can overcome difficulties obtaining in certain circumstances.

● THE **Nyasaland Flying Club** was formed by a group of enthusiasts in 1956 to revive private-flying interest and to provide flying tuition up to P.P.L. stage.

A disused emergency landing strip was acquired at Luchenza, about 40 miles from the Southern Province towns of Limbe and Blantyre. It had reverted to the surrounding African bush, and a lot of hard work went into clearing and uprooting trees, grading, laying runway markers, and so on, taking about six months.

● A SINGLE hangar was built by Mr. Desmond Tennett, using blue gum poles and corrugated iron, with a concrete floor. Next, a block of similar hangars to house three more Tigers was built. A petrol store, a 30-ft. signal tower and signals square have since been added.

The clubhouse was originally of pole and thatch, but has now been rebuilt in brick with an iron roof, and includes a kitchen and licensed bar, and there is a separate crew room, donated by one of the members. A borehole was sunk and water found at a depth of 50 ft. All work has been done by members themselves assisted by locally recruited African labour.

The club owns two Tigers, VP-YOC and VP-YPG, subscribed for by members, who number about 20, plus 40 social members. Dual and solo rates are £3 10s. an hour. Nearly all flying is done at week-ends and on holidays as, because of its geographical location between 10° and 15° S., darkness falls between 18.00 and 18.30 hrs. all the year round.

TOPPING UP.—Members of the Nyasaland Flying Club refuelling a Tiger Moth at Luchenza, where some enterprising work has recently been done.

● C.F.I. is Mr. Keith Wadhams. He is assisted by Mr. Robin Parker, who gained his assistant rating with the club last year. Four members—Norman Edwards, D. Tennett, C. Kaye and Dr. J. Harvey—gained their licences in 1957. Another member, D. Gooding, did all his dual instruction with the club and gained his P.P.L. at the Portsmouth Aero Club while on leave in the U.K.

The club is operated purely by private subscription, flying fees and catering and bar profits. Applications for a grant from the Nyasaland Government have so far not been successful. But the club has managed to keep its head above water, primarily through the hard work of the present secretary, Mr. George Bennett, and his predecessor, Mr. John Hough.

Two privately owned Tiger Moths, VP-YDC and VP-YMY, are hangared at the aerodrome, and belong respectively to D. Tennett and C. Kaye.

● AT THE " At Home " and flying display, organized by the **Elstree Flying Club** for tomorrow (June 14), will be demonstrations of aerobatics, formation flying, racing and parachute jumping, and a sailplane performance. The gates open at 13.30 hrs.; the programme begins at 14.45 hrs. and will last for about two hours.

Pilots: Take special note of signals area!

GLIDING NOTES

SO much happened at the R.A.F. Championships that Whitsun news from civilian clubs has been crowded out till now; yet it included some notable flights.

Whit-Sunday itself, which started with a northerly wind over the Scilly Isles and a south wind on the other side of England, was found a bit foxing by the forecasters, with the result that the R.A.F. competitors at South Cerney were given distance along a line N.E. by E. through Marham, and those at the Lasham Whitsun rally had distance along a line N.N.W. through Camphill. So all found themselves being drifted off course, one lot to the left and the other to the right.

Longest distance from Lasham, where 22 pilots competed in the Whitsun rally, was 190 miles by Tony Deane-Drummond in the prototype Olympia 419; he overflew Camphill and landed at Yeadon, beyond Leeds, at 19.00 hrs. Most of the others got away between 11.15 and 12.15, but were beaten also by David Ince, in the second Olympia 419, just delivered, in which he made 130 miles to Wirksworth, although he did not leave till after 14.00 hrs. Third in distance was Aylett Moore in his Eagle, and fourth Tony Goodhart in the Olympia 415 which he is to fly in Poland in the 15-m. class.

WORLD CHAMPIONSHIPS

NEXT WEEK and in following issues Dr. Slater will report from Poland on the progress of the Championships. We will also publish in due course an article by Peter Brooks on the technical aspects of the competing sailplanes.

* * *

From the London Club at Dunstable, on the same day, Geoffrey Stephenson made 87 miles N.N.E. to Boston in his Skylark 3 and Dudley Hiscox 40 miles N.N.W. All the aforementioned people crossed the track of Andy Gough, the only one to reach Marham from South Cerney, at angles between 45° and 60°.

Whit-Monday's task at Lasham was distance (not speed) round and round a 44-mile triangle with corners at Worthy Down and Whitchurch (Hants); Deane-Drummond, Ince, Aylett Moore and both Goodharts went round it three times.

Thunderstorms next day, travelling inland from W.S.W., just avoided Minchinhampton, where I was, because one series was being set off by the South Wales mountains and passed north, while the other, to the south, was more fully developed and must have been triggered by Exmoor, which was farther away. They were used by at least three people to get Gold "C" height. From Dunstable Douglas Bridson got to 12,000 ft. in a Skylark 2, somewhere in the elongated triangular gap between two airways, from Tring to Wing, which used to be 1½ miles wide at its base but now provides elbow-room for several cu-nims to jostle each other. From Lasham, Brenda Horsfield, who completed her Silver "C" a fortnight before, went up to 11,600 ft. in a Skylark 2 but released in such strong lift that no kink shows on her barograph, so her 3,000-m. climb is still in doubt. Lieut. Cdr. H. R. Dimock made a similar climb from Lasham, though he normally instructs naval gliders at Gosport.

It was a day for distance as well as height. George Burton, in his Olympia, tried for a two-legged Gold "C" from Lasham via Kettering to Gt. Yarmouth and reached Norwich. John Williamson took a passenger in the club Eagle 83 miles cross-wind to Malvern and 20 miles of the way back. Deane-Drummond dashed in at lunch time, did a 100-km. triangle, and dashed back to work. From Dunstable three pilots reached points north of Oxford.

New out-and-return records for the U.K. were set up from Lasham on May 28, a day of light and variable winds. John Williamson and Ann Welch in the latter's T-42 (Beagle) made a two-seater record of 104 miles westwards to Westbury and back, and Anne Burns, in a Skylark 3, a women's record of 94 miles N.N.W. to Kidlington and back. W. Kahn tried for a more ambitious out-and-return but landed at the turning-point, Gaydon, 72 miles to the north. Other flights from Lasham were by G. Barrell to Rugby and Mr. Kavasny (Polish Air Force Club) to Market Harborough, while from Dunstable G. H. Lee flew to Uppingham and H. Kuntze to North Luffenham.

News has just arrived of yet another Gold "C" climb, this time by an R.A.F. pilot, Flg. Off. David Cretney, of the Windrushers' Club at Bicester. On June 1 he climbed in a cu-nim to 15,600 ft. in 15 min., gaining 13,100 ft. above the release point. The Windrushers' best machine at the recent R.A.F. Championships was an Olympia, so, presumably, that is what he flew.

Per Ardua ad Australia—II

Between March 5 and April 29 this year, DAVID HILL *and his wife Merete flew a Prentice with a Gipsy Queen engine from Southend, England, to Melbourne, Australia. The first part of their story began on page 760 of our issue of May 30.*

The author putting the wraps on.

WE left England on Wednesday afternoon (March 5) and just after sunset on Saturday we arrived at Urbe Airport, Rome. Urbe is a fairly small grass airfield used for light aeroplanes, and has no lighting, so that we were very glad of our landing lamp, and equally glad to be on the ground. A minor swarm of people greeted us, and fired the usual battery of questions, and also helped to push our Prentice, "Koomela," to its dispersal where it was to remain until Monday morning.

We hurriedly produced our personal and aircraft documents to the interested parties, covered up the aircraft, and were then driven to a hotel in Rome itself by an Italian man, his girl friend, and a German who was able to do the necessary translation for us. We were made to feel very welcome in Rome, and the others talked enthusiastically while I cringed in the back of the car, horror-stricken at the way we got through the traffic.

In the morning we had another demonstration of one of the great advantages of air travel—you can never really count on going anywhere. As I drew back the curtains the morning sky looked just a little bit doubtful, but deciding that after all the delays we had already experienced it could not happen again, we packed our bags.

At Urbe we were faced with a tricky situation; the met. man spoke only Italian, and had a face as long as his opposite numbers in France. But a policeman came to our rescue, and translated into German to Merete, who gave it to me in English. However, two and a half years in Germany gave me a working knowledge of the language, and when the policeman summed up the meteorological situation as "Nicht Gut," I knew we had had it.

We braved the bus journey back to town, and took a small hotel near the station which was more accessible, and more in keeping with our rapidly dwindling supply of non-Sterling Area traveller's cheques. That was on Monday, and it was not until Thursday morning (March 13) that the weather gods took pity on us.

Even so our policeman friend still insisted that it was "Nicht Gut," but by this time a French speaker had appeared on the scene, and we were able to get more comprehensive briefing. Quite a lot of cloud round the mountains, but no more snow showers, and Napoli was a reliable diversion if something unpredictable should occur at our destination of Bari.

"Taking off from Bahrein the snow-white Vulcan caught our eye."

At last all was ready for departure, and we were anxious to get into the air again. But of course it was not quite as easy as that, and I learnt another lesson about air touring. Our first Italian bill for landing and parking charges comfortably exceeded my supply of ready cash, and they could not change a traveller's cheque. We just missed the bus to the nearest bank, but luckily got a lift after a frustrating period of unsuccessful thumbing.

We eventually got airborne at lunchtime, and I am quite sure "Koomela" was happy to lift her wheels off the sodden grass of Urbe. We picked our way through valleys of cloud and mountain, and I breathed a sigh of relief when we turned on to our final heading and arrived at the broad plain sweeping down to the coast.

We marvelled at the abrupt change from Europe to the Mediterranean, and relaxed in some real VFR flying. The route from Rome to Bari or Brindisi would be much simpler if light aircraft were able to follow the coast from Rome to near Napoli, and avoid much of the tricky mountain journey, but a prohibited area is strategically placed here to prevent this. A Gulf Aviation Heron had been lost in this area a few weeks previously, so I was happy to have this leg behind us.

We had a pleasant reception at Bari, and I envied the throaty crackle of a Merlin as a Mustang taxied out. It was followed by a neat little tricycle Macchi 306, and more Macchis of the two-seat Merlin-engined trainer variety were parked in dispersal. The Italian Air Force control staff made us comfortable while we awaited the departure of the Alitalia bus for town, and we rode to their office in the comfort of a modern airline bus. They had a service at a convenient time in the morning, and so we were able to travel both ways in style.

Our next hop was along the corridors to Athens, via Corfu and Araxos, and the met. man promised us good weather with maybe an occasional shower. And we got it. At Corfu we whipped round a hill top and descended rapidly to stay VFR, and passed the airfield of Maritsa at 500 feet in rain, being thankful that a Prentice has windscreen wipers. It cleared though, and after that there was no real trouble.

Greece looked very attractive as we passed tall snow-capped mountains, but we chickened-out at one hilly crossing and I hope the powers-that-be will forgive us if we perhaps just slightly strayed out of the corridor for a brief moment.

After three and a half hours' flying we successfully arrived at Athens without incurring the wrath of the Albanian fighter force, and discovered that Hellenikon Airport is an outpost of the American Empire. The Prentice looked a bit silly by a C-47 with Globemasters towering like Acropolis in the background, but we decided she was safe enough.

Here we learnt another lesson about Air Touring on a Limited Income. We were met by a chap wearing an airline uniform, and he asked us politely if we wanted "handling." I asked him what he meant by handling, and he replied that that meant the provisioning of chocks, picketing the aircraft and that sort of thing. I thought it was probably just normal service, done a slightly different way here, and so said "Yes, please." The smart reply for Impoverished Aviators is "No, thank you," because "handling" is something different. The bill was for a bit over £4, which included landing charges. . . .

I must say that they were very efficient and very helpful, and we had no holdups whatsoever.

The next day's flying was to take us to the island of Rhodes, and to Cyprus. The weather forecast for Rhodes was not very good, and so we filled the aircraft full of fuel in case we had to go direct to Cyprus, or even return to Athens. We got airborne at half past nine, and set off in pleasant flying weather with good visibility. At one little island we passed we counted twenty ships tied up alongside one another, and with many more around Athens they provided mute evidence of the present slump in shipping.

An hour out from Athens the weather worsened, and we encountered occasional squalls but luckily fairly brief in duration. They kept Merete busy though, mopping up the cockpit, and also took quite a bit of paint off our leading edges. However, Rhodes was quite clear, and although we had plenty of fuel, we decided we would land there for a cup of coffee, and file our flight plan for Nicosia. That was another mistake!

Just Not Done

It took us three hours to get off again, because they had had no notification of our flight, and the airport manager was not in attendance. He was the only one who could stamp our log book, and we just had to wait for him to come in. We learnt, however, that in international flying you do not just lob in for a cup of coffee.

We had more rain squalls on our way to Cyprus which made navigation a bit difficult. It is a 260 nautical-mile sea crossing, and the thought of our survival equipment in the rear cockpit was very reassuring. We were carrying two J-type single-seat dinghies, an American dinghy radio, and two Mae Wests. While all our survival gear added up to one hundred pounds in weight we felt it was essential for the flight. Luckily the Prentice has a spacious rear compartment, and so there is no problem in stowing the kit.

Somehow the island of Cyprus loomed up on track, and the weather cleared to give us a real VFR entry. After nearly two and a half hours' flying we touched down at Nicosia, and I really felt at home again with clipped and precise instructions from the tower, and the Duty Crew coming out to marshal us in. For a moment I forgot I was a civilian flying a private aircraft from England to Australia, but I returned to the present when we stopped and Merete climbed out beside me. I never took blondes flying when I was still in the Air Force. . . .

It was Saturday afternoon (March 15) when we arrived at Nicosia, civil airport of the barbed-wire island of Cyprus, but as the Royal Air Force Duty Crew marshalled us efficiently into dispersal it looked anything but a civil airport. Armed guards were dotted here and there round the tarmac, and the whole place seemed to be effectively surrounded by barbed wire. There was only one other civil aircraft there, a DC-3, of course, and the remainder were Hunters, Valettas, Hastings and Pembrokes, with a Beverley making an absurd silhouette on the skyline.

The sergeant in charge of the Duty Crew took care of the aircraft, and said that if they had no other commitments his boys would have a look over our Prentice for us. We knew she was in good hands, so made our way to the passenger terminal. There we discovered that getting into town was not an easy task, and we had to have an escort to take us to the Customs Office in Nicosia itself.

The Cypriot staff in the Operations Office were extremely helpful, and not only arranged hotel accommodation for us but also gave us a lift into town in their bus. Customs formalities did not take long, and shortly, with one of the Operations staff helping us, we arrived at our hotel.

Whilst the sun of Cyprus was warm, the stares of most of the population were ice-cold, and we felt a little of the tenseness that still exists in this troubled island. I was not anxious to prolong our stay, so we hoped for fine weather next day for our next hop. We had to cross the mountains of the Lebanon, which meant climbing to 9,000 feet, and I feared that the bad weather we had encountered on our way to Cyprus might still lie in that region. We got a lift to the airfield by a Cyprus Airways bus, and I made my way past numerous Service Police to the met. office. The forecaster said it was no go that day, but the prospects for the morning were better, so I made my way back to Operations, braving all the S.P.s on the way.

Next morning we went through the whole performance again, but this time met. was favourable and we were airborne. The R.A.F. had looked after our aircraft really well, and it certainly could not have been more closely guarded. But she was glad to be airborne again, climbing through clear Cyprus air on track for Lebanon and Syria.

This particular leg was one that I had been worrying about for some time. We had been told by M.T.C.A. in London that the Syrian authorities insisted that we land in Damascus, and we had received permission from Damascus to do so. But the Indian authorities in London, who handle Syria's business, told me that it would take eight weeks to get visas, and we did not have that much time available. They suggested we should try in Rome, where there is an actual Syrian Embassy, and this we did. They nodded when they saw Merete's Danish passport, but shook their heads when they saw mine. " We have no diplomatic relations with Australia, and we cannot issue you with a visa."

I explained that it was a Syrian rule that we must land at Damascus, said we only wanted refuelling anyway, and showed them my telegram from the civil aviation authorities authorizing my landing. After a few moments' deliberation they said we could land without visas, for refuelling only, and providing we did not leave the airfield. All the same, I wondered at the reception we would get.

We climbed over the deep blue Mediterranean, threaded our way through a few fluffy white cumulus, and levelled out at 9,000 feet. Soon the coast of Lebanon came into view, and how attractive it looked. Beirut itself sprawled a golden yellow against the blue of the sea, and in the background rose a giant zebra-skin of brown mountain and white snow. A layer of snow-white cloud completed the picture, and I regretted that my camera was well and truly stowed in the rear of the aircraft.

Beirut Approach cleared us through their area, and then we started the abrupt descent down to the brown plain around Damascus. It was fairly bumpy in the circuit, but " Koomela " did a nice landing, and obeyed the clear and concise instructions from Control. We taxied past a line of MiG 15s, noted two MiG 17s, and envied all the Spitfires dotted here and there around the airfield. An Il-14 and Mi-1 helicopter emphasized local politics, and as I cut the engine and climbed out my heart beat a little faster.

But I need not have worried. Our reception was very friendly, and our teddy bear, " Bamme," quickly made friends with some Syrian soldiers who came up to look at the aircraft. In the Airport Office they dealt with us quickly and efficiently, and I was given a lot of useful information on the route to Baghdad by a Syrian pilot there. A large picture of President Nasser grinned a toothpaste smile from the wall, and we felt hypnotized by his gaze.

After a stay of just over an hour we took off. Damascus is over 2,000 ft. above sea level, and as it was also the hottest temperature we had met I was interested to see how much runway we used. A sixty-degree crosswind did not help, but despite our heavy load " Koomela " took to the skies in her usual, perhaps unspectacular, manner

The next hop was 408 nautical miles of desert, direct to Baghdad. Our original intention had been to stage through one of the oil pipeline airfields, either H.3 or H.2, but H.3 was a prohibited area and H.2 had no fuel, so we decided to overfly. After setting course from Damascus I played tunes on my computer, stuck the answer on the compass, and drove on. The map and the country we were supposed to be flying over bore a healthy resemblance to one another, and after a couple of hours flying the dark blob of H.2 loomed up nicely on the track. The worst part of that leg was over.

Over Endless Desert

We still flew over endless desert, a white and yellow mass stretching from horizon to horizon, but had a bitumen road to guide us and finally Lake Habbaniyah appeared ahead. We had a nice wind to help us, and take-off to touch-down time gave us a ground speed of 118 knots. At Baghdad we parked between an Iraqi Airways Viscount and an Airwork Hermes, and managed to get a lift to town by Iraqi Airways bus.

Baghdad was full of vast new American cars, noises, and smells. The receptionist of the hotel enticed us in with the offer of a reduced rate as we were not having lunch, but did not tell anyone else when he went off duty, and we had to do quite a bit of talking. We stuck to our guns though, and had possibly the cheapest stay for years in one of Baghdad's leading hotels.

Next day we were up early as usual, but as there was no convenient airline bus we had to take a taxi to the airport. It was nice after weeks of freezing to feel warm again, and met. said " Nothing to worry about." We paid our 24s. landing and parking fee, and after obtaining the usual clearances we were airborne. Our destination was Kuwait, and after refuelling, on to Bahrein, but our first track took us to Basra to comply with Iraqi regulations. We flew close to Shaibah.

Between Baghdad and Basra we had a large area of swamp to fly over, but later this gave way to solid sand and we started seeing our first oil derricks. Sand gave way to sea as we neared Kuwait, and I tentatively asked Merete how she was feeling. " Fine," was her reply so I decided to overfly Kuwait and press on to Bahrein.

We followed the coast line as far as possible, and then made a short sea crossing to Muharraq Island where the airfield of Bahrein is situated. We had covered the 550 nautical miles in just five hours' flying time, and as we climbed somewhat wearily from the aircraft, we felt we had made real progress at last.

(To be continued)

CORRESPONDENCE

LOT—Polish Airlines

THANK YOU for your excellent report "Poland's Place in the Air" (THE AEROPLANE, May 9). Although the post-World War II LOT indeed faces a most formidable task to re-establish itself alongside other European national carriers, it is heartening to read of the latest developments in conjunction with B.E.A.'s recently opened Warsaw schedules with Viscounts. The time also seems opportune to recall that in 1939 LOT had the (little publicized) honour of operating the *longest non-stop scheduled flight* of any European airline! Using Lockheed 14s they flew a once-weekly Warsaw-Lydda schedule which stopped only at Rhodes Island. I am open to correction in this one, but writing from memory (as on holiday in the U.K.) I'm pretty sure the Warsaw-Rhodes non-stop leg handsomely beat all others in Europe back in 1939.

Gillingham, Kent. DENNIS M. POWELL.

That First Quarter-mile

WHEN historians are accused in public of being unjust they are apt to react sharply. So here goes.

Because of A. V. Roe's great and historic place in aviation, I—and others—have leaned over backwards to accept that he was airborne for distances of up to 150 ft. (Roe gives this as a maximum) in June of 1908. Now let us be extra-judicial and a little cynical for a moment.

Two months after the alleged flights in June, Roe wrote in August, 1908, to Wilbur Wright, enthusiastically describing his recent work in aviation. Here was the one occasion when a young man would say everything he could in his own favour: yet we find him writing "... in all I managed to get six trials. ... I managed to make several flights towed by a motorcar." There is not one word about any free hops or flights. When questioned by the Gorell Committee about this extraordinary omission, Roe replied that he "had not regarded these as of importance and, further, that it had been extraordinarily difficult for him to decide when in these early flights he was off the ground and when not" (Gorell Committee Report). Incidentally, with his small-diameter wheels on the rough Brooklands surface, I should have thought the lack of vibration if airborne would have been striking.

We next find Roe writing at length to the Press in June of 1909 about his first triplane: "It may come as a surprise to your readers to learn that I have been making dozens of short flights ... during the last few weeks: true, they are hardly more than jumps, being only 2 and 3 ft. high and 50 or so ft. in length." But there is still no mention of the hops of far greater length back in 1908 which he and his friends came later to claim. It is indeed strange that Roe felt hops of 50 ft. in June, 1909, worth telling the world about, whereas one of 150 ft. a year earlier went unannounced at the time and until long after.

Thirdly, one of Roe's witnesses before the Gorell Committee said that the flight location was the finishing straight at Brooklands. As that part of the track ended in an upward slope, are we to believe that the young inventor got up speed and took off towards the slope? Surely any sensible person would have wheeled the machine as far as possible up the slope, and then taken off down it. There is, at any rate, a strong probability that any hops were in fact powered glides.

It was to avoid all such doubts and difficulties that I suggested—and Farnborough agreed—that a distance of about a quarter of a mile through the air was a reasonable criterion for a successful flight, since it makes nonsense of the whole matter if we are concerned, as Griffith Brewer said, with an unsuccessful one.

The passage of mine about a modified ballistic trajectory was merely one of the points to be considered, especially with Cody, who was flying from uneven ground. An aeroplane's job is to fly, and it is purely frivolous to make serious claims, especially as late as 1908, for isolated airborne distances of a few feet.

Roe became one of the greatest men in flying history; but in 1908 he was young, and in fact he made a very slow start in aviation, since he could not fly properly until late in 1909: by July, 1909, he could only manage 600 ft., and it was not until December that he flew half a mile.

The first Briton to fly in Britain was indubitably Lord Brabazon, who on April 30-May 2, 1909, made a number of flights, the longest of which was 1,500 ft.

Finally, Mr. G. Verdon-Roe seems oddly misinformed about the Wright brothers. On December 17, 1903, they were flying into a stiff wind, and travelled 470-600 ft. through the air on their first take-off, and half a mile on their fourth and last that day. Incidentally, on November 12, 1906, Santos-Dumont covered some 722 ft.—not 75 ft.—in 21 seconds.

My apologies, sir, for appearing (only) to denigrate a man for whom I have the greatest admiration. But historians have their pride—odd as it may be—and sometimes cannot resist defending themselves when attacked.

Piccadilly, W.1. CHARLES H. GIBBS-SMITH.

Groundabout

Jungle Jingles. In between flights which include ferrying African labourers between Nyasaland and the Rand gold mines, the crews of Central African Airways and Africair get a wry smile from the collection of definitions compiled by Frank Brindley, A.T.C.O., at Blantyre Airport in Nyasaland. For instance:—

Briefing: An exchange of pleasantries between two parties, one of whom knows the route like the back of his hand and another who has read about it.

VMC Descent: Any part of a descent wherein it is possible for both pilots to read the *Daily Mirror*.

Time Check: Married pilots' method of concealing non-ownership of wrist-watch.

Pressure: That stuff under which A.T.C.O.s work so magnificently.

Steady Red: A Russian fiancée.

Notams: Instructions on how to close the stable door after the horse has done a bunk.

*

Add Roughness and Reciprocate. The Weybridge Diploma has been awarded to the T.A.A. lady passenger who, accustomed to DC-3 travel, complained that the Viscounts were "too smooth and failed to give the impression of flying."

*

"I want you to meet Mr. Threep, sir, our most vital statistic—he's flown to America and back with us every week for the past four years."

*

Help

The good squadron spirit still persists. Four pilots, soon to leave their squadron, are prepared to lay out £20 for something, perhaps to be competed for, to perpetuate their regard for the old firm. But what? Not, they have decided, a silver trophy, but something different. Any ideas?

by Gren

NOTES AND EVENTS

ADVANCED THINKING.—Aviation Traders (Engineering), Ltd., has designed and manufactured this road trailer for transporting the Rolls-Royce Conway by-pass turbojet.

A.S. MERGER. — Rearrangements brought about by concentration on new civil projects has resulted in Armstrong Siddeley (Brockworth), Ltd., being absorbed into Armstrong Siddeley Motors, Ltd. The Brockworth plant, covering a million square feet, will continue to manufacture and repair aero-engines and produce Armstrong Siddeley Diesel engines; it will shortly manufacture under licence Maybach Diesels for locomotives and for marine and other purposes.

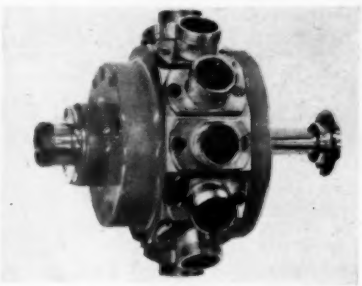
COMPUTER PROGRAMMES. — Ferranti, Ltd., has issued a second list of programmes on which the company's Pegasus computers are being employed. Not including any of the programmes in the Pegasus library, the list is designed to help in the interchange of information between all users of the computer.

COLLEGE OCCASION.—The annual presentation ball of the College of Aeronautics Students' Society will be held in Lanchester Hall, Cranfield, on July 4 from 22.00 hrs. to 05.00 hrs. Dress, dinner jackets or uniforms.

B.O.A.C. ENGINE TESTS. — The British Reinforced Concrete Engineering Co., Ltd., of Stafford, has designed a 32,000-sq.-ft. engine workshop and test cells being built for B.O.A.C. at Nantgarw, near Treforest, by W. and C. French of Buckhurst Hill. The 30-ft.-high workshop block has a reinforced concrete frame and includes provision for the control equipment to be cantilevered towards the test cells to avoid ground transmission of noise and vibration. The test cells comprise the engine test area, with inlet and exhaust areas containing splitters for noise absorption. A pre-stressed 6-in. shell, 50 ft. long by 28 in. in diameter, changing to rectangular section, 28 ft. by 30 ft., provides a Venturi lining to ensure correct air flow.

DOVE DEMONSTRATOR. — The D.H. Dove operated by Smiths Aircraft Instruments, Ltd., has recently returned from a 5,000-mile sales tour of Europe. The specially equipped aircraft was used to show the latest Smiths auto-pilot and flight-director equipment besides cockpit and navigational instruments. Captain of the aircraft was the company's chief pilot, Mr. R. A. Palmer, and a total of 50 hours was flown including 15 for demonstration purposes.

12-WAY CO-AXIAL SWITCH.—A new product of Racal Engineering, Ltd., of Bracknell, Berks, is the MA.42 co-axial switch designed to simplify selection in a VHF transmitter or receiver



operating with a number of aerials at different frequencies. The company claims as special features, rapid aerial selection without disconnection; true co-axial construction; low-torque operation; and 1-kW. handling capacity.

FILM CATALOGUE. — The Shell Petroleum Co., Ltd., has published a new edition of its film catalogue. It lists all Shell films for international circulation, under the headings "The Petroleum Industry," "The World Served by Oil" and "Shell Cinemagazines." The catalogue is available only to representatives of organizations, who should write to Film Section, Public Relations Dept., The Shell Petroleum Co., Ltd., 1 Kingsway, London, W.C.2.

Company Notices

NEW COMPANY

Agricultural Aviation Co., Ltd. (605,010).—Private co. Reg. May 22. Cap. £100 in £1 shs. Objects: To carry on the business of crop spraying contractors, owners, hirers and letters on hire of and dealers in spraying machinery, aircraft, etc. Subscribers: Danny F. Speck, Newstead House, Newstead Duns, engineer (10 shs.); John R. Howard, Midland Bank Chambers, Howardsgate, Welwyn Garden City (one sh.). Danny F. Speck is first director. Sec.: Rosamund P. Speck. Solrs.: A. Russell Jones and Co., Welwyn Garden City. Reg. off.: Midland Bank Chambers, Howardsgate, Welwyn Garden City.

CHANGE OF NAME

Airco, Ltd. (309,297).—109 Jermyn Street, London, S.W.1.—Name changed to R. H. Stocken and Co., Ltd., on March 25, 1958.

New Patents

APPLICATIONS ACCEPTED

798,482.—Short Bros. and Harland, Ltd.—"Parachute and like release mechanism."—May 25, 1956. (June 6, 1955.)

798,744.—Hobson, H. M., Ltd., Westbury, R., and Smith, C. P.—"Aircraft."—Oct. 21, 1955. (Dec. 7, 1954.)

798,515.—Napier and Son, D., Ltd.—"Reaction jet propulsion systems for multi-engine aircraft."—Nov. 29, 1956. (Dec. 14, 1955.)

798,617.—Soc. Rateau, and Auxionnaz, R.—"Aircraft propulsion."—Nov. 13, 1956. (Nov. 23, 1955.)

Applications open to public inspection on July 23, 1958; opposition period expires on October 23, 1958.

Aviation Calendar

June 14.—Elstree Flying Club "At Home," at **Elstree Aerodrome,** Herts.

June 14.—Plymouth Aero Club Air Display, at **Roborough Aerodrome,** Plymouth.

June 14-15.—P.F.A. Rally at **Rhoose Airport,** Cardiff.

June 15.—Jodel Air Rally at **Laon,** France.

June 15-20.—Rally of the Stars, organized by the Milan Aero Club, **Naples-Pescara.**

June 15-29.—World Gliding Championships organized by the Polish Aero Club, at **Leszno,** Poland.

June 16-18.—12th Meeting of AGARD Aeromedical Panel, at the Palais de Chaillôt, **Paris.**

June 18.—Kronfeld Club talk, "The Early Days," by F. N. Slingsby, at 74 Eccleston Square, **London,** S.W.1, at 20.00 hrs.

June 20.—Inst. of Navigation discussion, "The Significance of Blunders in Navigation," at the R.G.S., 1 Kensington Gore, **London,** S.W.7.

June 20-23.—Tour of the Pyrenees, organized by the Lerida Aero Club, **Spain.**

June 20-23.—Ninth International Air Tour of **Sicily** organized by the Palermo Aero Club.

June 21.—Air Display organized by North London Aero Club at **Panshanger Aerodrome,** Herts.

June 21.—R.N.A.S. **Ford** "At Home."

June 22.—R.Ae.S. Garden Party at **White Waltham Aerodrome,** Berks.

June 25-27.—R. Meteorological Society Meeting, at Trinity College, **Dublin.**

June 27-29.—Liège Air Meeting, at **Bierset Aerodrome,** Belgium.

June 28.—Exeter Aero Club, Air Display at **Exeter Airport.**

June 28.—R.A.F.A. Air Display at **Staverton Aerodrome,** Gloucester.

June 28.—R.N.A.S. **Abbotsinch** "At Home."

June 28-30.—R.Ae.C. Invitation Air Rally, at **La Baule,** France.

July 4.—Presentation Ball of College of Aeronautic Students' Society, at Lanchester Hall, **Cranfield,** Beds. 22.00 hrs.-05.00 hrs.

July 5.—NATO Air Display at **Soesterberg,** Holland, at 15.00 hrs.

July 5-6.—12th Rally of the Wines and Chateaux, organized by Aéro-Club de l'Ouest at **Anjou,** France.

July 5-6.—Professional Race Pilots' Association, Air Races at **Fulton, New York.**

July 5-7.—R.Ae.C. Invitation Air Rally, at **Deauville,** Calvados, France.

SPRAY TRUCK. — A portable metallizing truck to give maximum mobility and efficiency has been developed by the Metallizing Equipment Co., Ltd., of Chobham, Surrey. A built-in wire rack accommodates several coils of various metal-spraying wires; shelves are provided for spare tools and equipment, and gas and oxygen cylinders are carried within the wheelbase. The truck measures 2 ft. 6 in. wide by 4 ft. 6 in. long and, in the completely collapsed condition for ease of transport, is 1 ft. 2 in. high. The rigid chassis is mounted on four heavy-duty wide-tread rubber-tyred wheels.

E.M.I. ORDER.—Sir W. G. Armstrong Whitworth Aircraft, Ltd., has placed an order with E.M.I. Electronics, Ltd., for a general-purpose analogue computer. Costing more than £55,000, the equipment is to be used for the study of complete guided-weapon or aircraft systems.

Birth Notices

Barnden.—On May 27, at Heacham, to Daphne (*née* Haunton), wife of Flt. Lt. R. J. Barnden—a son.

Dean.—On May 22, at Naples, to Margaret Doreen, wife of Flt. Lt. A. S. Dean—a daughter.

Lord.—On May 27, at Barnstaple, to Elizabeth (*née* Esplin), wife of Flt. Lt. R. K. Lord—a son.

Mitchell.—On May 28, at Northampton, to Susan (*née* Hancock), wife of Flg. Off. G. Mitchell—a son.

Tull.—On May 26, at Tunbridge Wells, to Betty (*née* Day), wife of Flt. Lt. G. A. Tull—a son.

Whitaker.—On May 31, to Margaret (*née* Jordan), wife of Sqn. Ldr. J. G. Whitaker—a daughter.